DOCTOR OF HEALTH (DHEALTH)

How well prepared is the next generation of health professionals to use health care informatics? A qualitative study of stakeholders' views about health informatics curricula in the UAE

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Patricia Visosky

A thesis submitted for the degree of Professional Doctorate in Health

University of Bath

Department for Health

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Acknowledgements

First, I wish to thank my mentor, my inspiration and my dear friend, Doctor Tayeb Kamali. Because of his faith in my abilities as an educator and a student I was able to embark on this most incredible journey. Doctor Kamali showed me what a true and dedicated teacher looks like and I can only hope to follow his lead. I will be forever grateful.

I would also like to thank my supervisors, beginning with Doctor Fiona Fox. It is because of her endless support and guidance that I have arrived at this point today. I have learned so much working with Fiona these past years and am so grateful for her shared wisdom, her patience and her exemplary example. I would also like to thank Doctor Patrick Doran for his continued support throughout this research process. Patrick's encouragement to "write at least one page a day" truly helped to keep this project in motion. I would also like to thank all of the participants who shared their time and thoughts with me. I am most grateful to you all.

Next, I wish to thank my friends and colleagues for their advice, support and patience. I especially want to acknowledge Joan Crisp, whose counsel, wisdom and especially her friendship has been such a precious gift.

Finally, and most importantly, I wish to thank my family. My husband, Terry, has selflessly and continuously encouraged me, making sure this dream came true. He watched and waited, commenting that his favourite scene was of me seated at the computer with our dog, O'Malley by my side. I could have never accomplished this without them. My brother-in-law, Jack has been my greatest champion and I am forever grateful to him. And, lastly, my thanks go to my dear sister, Lynn. Her love and her strength are beyond measure and a gift I hold most dear. This thesis is dedicated to them.

Abstract

The term health informatics (HI) refers to the management and use of healthcare information, via technological innovations to improve health care. With the exponential increase in HI it is crucial that health graduates are well prepared to use the variety of technological resources in the workplace. In order to determine the degree of preparedness, this research investigated the perceptions and experiences of relevant stakeholders at an academic setting, about the inclusion of HI in health science curricula. The setting was a tertiary academic institution in the United Arab Emirates. Healthcare facilities in the region had included an electronic health information system in their strategic and operational planning. It is therefore necessary for academic institutions to equip its graduates with requisite competencies in HI. However, initial review of matrices indicated this was not the case. This investigation focused on factors contributing to the delay in development of informatics curriculum.

The purpose of this study was to identify differences in perceptions between various stakeholders and to determine what impact these differences might have on the development of HI curricula. Inherent in this was the exploration for potential to mitigate any differences between and amongst stakeholders. A study of stakeholder knowledge, perception and acceptance of HI would facilitate an understanding of how successfully HI curricula might be integrated into the college network. Accordingly, attention was paid to commonalities and differences in beliefs of stakeholders within each division. Knowledge gained from this research would facilitate the development of relevant HI curricula to support each specialty within the program.

This was a qualitative study involving focus groups with key stakeholders of HI education. These included the ‘providers’; academic management and faculty (or staff) and the ‘consumers’; Students and Alumni. Findings were analysed using thematic

analysis and the differences between providers and consumer perspectives were explored.

Data were analysed using three pre-determined core categories pertaining to HI; perceptions, preparedness, and future plans. Iterative review of data subsequently identified four distinct sub-themes: communication, confidence, responsibility, and curriculum. The findings suggest that communication, confidence and responsibility are key issues affecting the experiences of all stakeholders in relation to HI.

(1) **Communication:** The process of communication between healthcare providers and consumers had become quite complex partly due to the tendency to function in silos, which was identified as a barrier to communication. Methods of integrating informatics applications in health science curricula had been initiated in some programs within this college network. However, often the discussion of design, implementation and learning outcomes were shared for the first time during the focus group.

(2) **Responsibility:** Uncertainty about where to assign responsibility for HI was also a key finding. Alumni suggested both the health sector and academia “didn’t know what to do with it” suggesting this was due to a lack of policy and governance. In the absence of such guidance, responsibility had neither been given nor taken.

(3) **Confidence:** The findings indicated that most stakeholders lacked confidence in their understanding of and preparedness for HI in their salient health-related academic profession.

(4) **Curriculum**: The findings indicate that there is an urgent need to incorporate HI curricula. Most noteworthy was the impact of the focus group forum itself, in fostering dialogue to operationalize these discussions.

Applying the tenets of diffusion of innovations theory to this study enhanced the interpretation of findings. The characteristics of each stage of diffusion aptly fit various participants, facilitating an understanding in appropriate context. This theory explores the manner in which new or unfamiliar concepts are disseminated amongst members of a social system over time. Rogers' (2003) diffusion of innovation theory suggests adoption and diffusion of the innovation are dependent upon end-user “awareness, interest, evaluation, trial and adoption” (Ward, 2013, p. 223). The interface between information technology, healthcare and academia is of key significance to this research. Application of this theoretical framework guided analysis of findings; focus group discussions were examined using these tenets of diffusion of an innovation, in this case, health information technology in academia. Successful adoption of information technology applications is determined by four key constructs: communication channels, attributes of the innovation, characteristics of the adopters and the social system (Zhan, Yu, Yan, & Spil, 2015). These four determinants of adoption are embedded in the diffusion of innovation theory and were the basis of the thematic analysis of findings. Methods of communication regarding HI amongst and between academia and healthcare provided valuable insight into the diffusion and adoption of this new concept.

There are five key attributes of an innovation: relative advantage, compatibility, complexity, trialability and observability (Zhan et al., 2015). Conducting the analysis of focus group discussions through this lens enabled enhanced understanding of the three key issues: communication, responsibility and confidence.

Characteristics of the adopters are based on attitudes towards the innovation. Rogers suggested there were five such characteristics: innovators, early adopters, earlier majority, later majority and laggards (Sahin, 2006). Each of these characteristics was observed throughout the focus groups. This structure and definition facilitated detailed analysis of findings as elements of each characteristic were studied.

The social system, as a determinant of adoption, focuses on the "set of interrelated units engaged in joint problem solving to accomplish a common goal" (Rogers, 2003, p. 23). This social system contributes to the perception, adoption and assimilation of the innovation. Each tenet of Rogers' (2003) diffusion of innovation theory facilitated detailed conceptualization of adoption in the context of health informatics curricula.

The health sector had demonstrated its commitment to improving health outcomes by adopting the latest developments in HI applications. The manner in which academia had aligned tuition, ensuring graduates were equipped with salient knowledge and skills, was the focus of this study. The findings of this research suggest that much work remains to be done in order to adequately prepare the next generation of healthcare professionals for the effective use of HI in the workplace.

List of Appendices

Chapter 1 – Introduction

1.1 Introduction

Healthcare is an information intensive industry. The focus of my career for over 40 years has been to ensure that rapidly changing methods of sharing health information are accessible to the appropriate stakeholders in both the health and academic sectors. Inherent in this has been the continuous monitoring of end users' information needs and applications, all with the goal of improving health outcomes. This interest in managing health information might be attributed to my father who often said he preferred a doctor who knew where to find the information rather than one who thought they knew it all.

The current, pervasive use of technology has had a substantial impact on how health data and information can be shared. The introduction of health information technology or health informatics (HI) began in the 1970s, accompanying the arrival of personal computers and the advancement of information technology (IT) applications for use in all sectors, including health (Mihalas et al., 2014). The arrival of the Internet in the 1990s further enhanced the functionality of these IT applications. The ability to capture, store, monitor and share data were well supported by IT systems. Design and implementation of health information systems (HIS) and electronic health records (EHR) began to appear within this same time frame (Mihalas et al., 2014). More recent developments in the form of social media networks enable communication, support and education for patients, caregivers and clinicians, all in the pursuit of improved health outcomes (Kamal, Fels, & Ho, 2010).

The health sector of the 21st century continues to assess, research, design and deploy HI to an extensive group of consumers. Recent developments include advancements in clinical decision-support systems (CDSS) connecting clinicians to the latest research findings and an extensive medical knowledge base, enabling efficient, effective and safe decisions (Cresswell, et al., 2012). Another key example of HI is the integrated, interoperable, regionalized EHR linking healthcare providers to their patient across the care continuum. The list of current and new innovations and implementations of HI is extensive. CDSS and the EHR have been highlighted here as key examples of IT applications in the health sector as each depends heavily on data and information, which is core to all HI applications. Each system provides an essential service to a wide range of consumers from the health, academic and government sectors, by providing access to current, accurate, health data and information. Most, if not all, clinical and allied health professionals are expected to be proficient in the use of these HI applications. Accordingly, academia has a key role and responsibility to ensure its graduates have the required HI knowledge and competencies. The aim of this research is to gain an understanding of how these consumers, specifically those in the academic sector, perceive these HI applications. An additional objective is to investigate how the academic sector perceives its role and responsibility in educating future healthcare professionals in the salient use of HI.

The introduction of HI, essentially the application of information and communication technology in the health sector, has the potential to affect multiple and essential improvements in health and wellness. The delivery of safe and effective healthcare is enabled by the immediate access to current health information, to other members of the healthcare team, to recent, proven and legislated advancements in investigations and treatments. This technology also supports inclusion of the patient. This fosters a greater understanding of one’s condition, thus strengthening compliance with treatment plans and lifestyle choices. Improvements to health outcomes are the ultimate goal. Greater efficacy in utilization, risk and financial management in the health sector represent additional potential benefits associated with a healthier population. However, literature suggests “methodologically strong evidence” (Doupi, 2016, p. 220) of any return, specifically improvements in health outcomes and systems efficiency, from this fairly significant investment is scarce. This lack of confirmed, sustained evidence has contributed to stakeholder concerns about the credibility and reliability of this resource (Doupi, 2016).

The list of HI stakeholders is extensive. A stakeholder may be defined as an individual or group that is involved in the design and/or use of health informatics applications (Lee & Sheikh, 2016). Considering the common element of HI is health data and information, the scope of designers and users is understandably quite broad. Key stakeholders of HI include: healthcare institutions, clinical and allied health professionals, healthcare IT industry, professional associations, academic institutions, patients, clinical research institutions, pharmaceutical industry, and government.

1.1.1 Benefits to Stakeholders

Implementation of an interoperable EHR, as discussed, has the potential to improve the quality of health outcomes and is of key importance to all stakeholders. An associated benefit is the ability to share best practice, leading to enhanced clinician knowledge and understanding, and ultimately to standardization of practice. Further, this group of stakeholders, as a result of knowledge gained during HI design and implementation, may provide valuable insight pertaining to required core competencies. This new knowledge could in turn provide valuable guidance to stakeholders in the academic and government sectors. Obtaining a contextual understanding of stakeholder need is essential if this technology is to gain acceptance and achieve its full potential (Wyatt, 2016). This research examines the topic from the perspective of the academic sector.

1.1.2 Aim of Research

The aim of this research, as discussed in the Research Proposal (Appendix A) is to explore stakeholders' perceptions, knowledge, and acceptance of the introduction of HI curriculum in undergraduate health science programs. For the purposes of this study, stakeholders have been identified as academic management, faculty, students and alumni. The objectives are to understand and map any enablers and barriers to the inclusion of health informatics curriculum. The following questions have been established as a framework for this research:

- What are the perceptions of stakeholders (faculty, students, alumni, academic management) regarding an academic health informatics module?
- What are the barriers to and facilitators of the integration of an academic health informatics module?

Outcomes of this research highlight stakeholders' perceptions and knowledge of health informatics specifically pertaining to the development and integration of biomedical/health informatics curriculum. This study identifies differences in perceptions amongst the identified stakeholders, facilitating a contextualized understanding within this academic environment. Analysis of research findings describes what impact these differences in perceptions might have on the development of HI curricula. This investigation also offered the potential to mitigate any differences between and amongst stakeholders.

The status of communication amongst stakeholders was a key finding. Health professionals and academics tend to work in silos (McCartney, 2016). The deleterious result of this scenario within the academic setting of this research was quite pronounced and is addressed further in the Findings and Discussion sections of this thesis.

1.2 Implementation of Informatics in Health, Academic and Commercial Sectors

Technological advances, coupled with a more knowledgeable and health literate consumer, have been cited as the impetus behind the exponential evolution of HI (Miriovsky, Shulman, & Abernethy, 2012). Electronic health information systems and other HI applications have advanced rapidly in an attempt to respond to the needs and expectations of all stakeholders of health (Greenes & Shortliffe, 2009). Decision-making at every stage of health care and service is dependent upon data and information. Essential patient-centric information can be collected, shared and analysed amongst healthcare providers, patients and families by means of health information systems. In spite of this, literature continues to describe the adoption of HI as sporadic and less than optimal amongst the majority of its stakeholders. The complexity of stakeholder relationships within the health sector has been cited as a key barrier to acceptance and use (Christodoulakis, Asgarian, & Easterbrook, 2017). As an example, the patient perceives the healthcare system as a resource; this perception differs vastly from that of the government who views healthcare as a compilation of policy systems (De Savigny & Adam, 2009). The information needs and purposes of these two stakeholders likewise are very different and yet each shares a common goal. The complexity of this scenario increases with the addition of requirements specific to the academic and health sectors. Aligning information and communication technology with the needs, expectations and rights of this diverse network of stakeholders is the challenging task assigned to HI.

1.2.1 Implementation of Informatics in the Commercial Sector

In contrast, the implementation of informatics in other sectors has allegedly met with greater efficacy. Numerous commercial ventures engage information systems that have completely transformed structure, process and outcome. This is evidenced by innovations such as Uber - a transportation service that owns no vehicles, or AirBnB – a hospitality service that owns no properties, or Facebook – one of the most populated social media networks with virtually no content. Information and communication technology is at the very core of each of these ventures. The success and ubiquitous use of these systems is self-evident. Transformations in commerce and service industries have imposed changes in societal behaviour and expectations, such that acceptance and use have become embedded in everyday practice. In addition, partners and competitors in the commercial sectors have responded by assessing and revamping the systems and methods by which they interact with their consumers and other stakeholders (Rigby & Ammenwerth, 2016).

1.2.2 Concepts Driving Innovation in the Commercial Sector

Determining what drives these innovations in the commercial sector with such apparent efficacy could provide valuable guidance to the health and academic sectors. A primary motivation to transform and modernise systems in the commercial sector is market competition (Marshall & Parra, 2019). As an example, online shopping has allowed merchants to expand their customer-base to a global rather than local or even regional market. Competitors are required to respond to market competition with similar if not enhanced innovations. Research suggests cost control is another component which influences and motivates innovations. This contemporary concept refutes the previous, more traditional belief that cost control and reduction had a “negative influence on innovative activities” (Su & Tang, 2016, p. 8). Consumer behaviour patterns and expectations also drive change in organizations. Current population statistics in the United States reveal its largest demographic consists of those born after 1997, referred to as Generation Z (Duffin, 2019). Members of this segment of the population are known to be “digital natives” (Mohr & Mohr, 2017, p. 86), or born in the era of informatics. Understandably, the commercial sector has endeavoured to align its systems, processes and products to accommodate this group's competency with and expectations of technology.

1.2.3 Implementation of Informatics in the Health and Academic Sectors

Conversely, literature maintains the health sector has not realised a similarly efficient adoption of informatics. Research has shown that despite significant investment in technology by the health sector, little evidence exists to prove a positive association between this investment and improved health outcomes (Agha, 2014). Considering this, it would seem prudent for the health sector to assess the efficacy of its systems, comparing their findings to those of the commercial sector. Lessons learned could provide valuable insight to those responsible for the design, implementation and maintenance of health information technology.

This same advice might be levied upon a key stakeholder of the health industry, that being the academic sector. The uptake of HI in academia has met with a similarly sporadic and tentative implementation. HI education and training must address the learning needs of a complex yet inter-related network of health science students. While roles and responsibilities of clinical and allied health professionals are quite dissimilar, all are reliant upon health data and information, which is critical to their decision-making. Information generated by one component of this healthcare team can be of vital importance to several other members within the health sector. This describes the fundamental purpose of HI. Its relevance to all health science students should therefore be self-evident. However, literature describes difficulty in establishing a sustainable educational program that adequately equips graduates with required HI knowledge and competencies (Hovenga & Grain, 2016). This is attributed to the inability of both the health and academic sectors to reach consensus on the definition of HI. The resulting ambiguity of purpose and definition has had a direct impact on the design of HI curriculum. In the absence of a commonly understood definition, development of HI learning outcomes is difficult, if not impossible. Educational facilities need to align curriculum with workforce needs and expectations to properly equip graduates. Hovenga and Grain (2016) suggest an unclear understanding of this concept and its place in the health sector has contributed to a delay in development of curriculum and training opportunities for a wide variety of students. Research further attributes academia's hesitancy to include HI education and training to a lack of knowledgeable, skilled faculty and academic leadership (Murphy, Stramer, Clamp, Grubb, Gosland, & Davis, 2004). Educators have been accused of poor to non-existent compliance with professional development requirements, thus accreditation standards. This is seen as contributing to the common, yet unacceptable, scenario found in the academic sector. These claims align with the findings of this research, which initially identified a distinct uncertainty and lack of confidence regarding HI perception, knowledge and future plans amongst stakeholders within this academic setting.

This translational approach, adopting and adapting efficient systems from the commercial sector to meet the salient needs of the health sector, is expected to result in a cost-effective, safe and ultimately successful informatics implementation (Rigby & Ammenwerth, 2016). Clearly, a similar deduction could be made of the academic sector. While still a work in progress, it would seem this is not yet a claim either sector can make.

1.2.4 Concepts Driving Innovation in the Health and Academic Sectors

It is important to reflect upon the elements driving innovation in the commercial sector: market competition, cost-containment and consumer behaviour patterns. The extent to which these same drivers influence innovation in the health and academic sectors may differ. Transferring successful elements of innovative practice from the commercial sector requires close scrutiny and refinement in order to align with the mission and purpose of both the health and academic sectors. This is not to say either sector is devoid of innovation. There has been an abundance of innovative advancements in both the health and academic sectors resulting in significant improvements in practice and outcomes. Examples of successful innovations in healthcare include technological advances in medical devices, procedures and treatments (Omachonu & Einspruch, 2010). Innovations in education include strategies such as Education for Sustainable Development (ESD). The primary goal of ESD is to ensure graduates are well-informed and responsible decision-makers thus enabling them to assume their role as global citizens (Kolleck, 2019).

1.2.5 Health Sector

Key drivers of innovation in healthcare focus on improvements to "quality, safety, outcomes, efficiency and costs" (Omachonu & Einspruch, 2010, p. 10). While sustained improvements in each of these fields might ultimately impact market competition, this concept is not immediately identified as motivating innovation in this sector. Divergent views exist in literature relating to the impact of market competition as driving innovation in the health sector. Some research has shown attempts to promote competition by introducing a market-driven approach to health service delivery has achieved some efficiencies (Akenroye, 2012). Conversely, other research has shown efforts to foster competition amongst healthcare providers has had a negative impact on health outcomes (Moreno-Serra, 2014). It is difficult to determine consensus; however, some researchers submit the concept of market competition in healthcare is inconsistent with the basic tenets of this sector (Akenroye, 2012).

Cost-containment, on the other hand, has increasingly become a critical focus of health policymakers, managers and professionals. This group of stakeholders have been tasked with providing equitable access to quality healthcare within budgetary constraints. Reports of rising costs, increasing incidence of medical errors and the inability to afford healthcare have understandably caught the attention of all stakeholders, including the patient (Gupta, Harrington, Pexton, & Trusko, 2007). Considering a basic premise of HI is to provide shared access to health data and information, the potential to contain costs would seem obvious. For example, clinicians have the ability to view investigation and treatment plans and outcomes, eliminating the need for duplication, thus reducing costs. Literature suggests this further results in a reduction in both clinician workload and medical errors, resulting in reduced healthcare spending (Kumar & Aldrich, 2010).

Considering the concept of consumer behaviour patterns driving innovations in the health sector first requires definition of the term consumer. There are many consumers of health, all existing in a purposely integrated, interdisciplinary environment. The patient is often considered to be the primary consumer of health. Accordingly, attention to the behavioural patterns of this consumer group has resulted in many, recent innovations. An example is the emerging use of social media to connect patients with the goal of providing support, education and opportunities for early intervention (Benetoli, Chen, & Aslani, 2019). Another example is the use of cloud technology, which has purported to effect significant benefits within the health sector (Sadoughi, Ali, & Erfannia, 2020). However, this innovation has met with varying degrees of success. Many in the health sector perceive the potential for breach of privacy and security of patient information as a significant threat and therefore a detractor to this innovation (Omachonu & Einspruch, 2010). Other literature suggests the need to establish communication networks, a key driver of innovation in the commercial sector, is not yet perceived as an impetus to adopt innovations in information and communication technology in the health sector (Gupta, 2008). This conflicts with the apparent seamless uptake of a similar innovation in the commercial sector.

1.2.6 Academic Sector

The scenario within the academic sector suggests market competition plays significantly in the drive to stimulate innovation in education. Academic institutions now compete on a global level. The innovative use of technology in on-campus and distance education has notably appealed to both domestic and international students. The anticipated goal of such innovations in pedagogy is to produce a graduate equipped with knowledge and competencies valued by a global employer (Wrigley & Straker, 2017). Studies on student choice in academic institutions, focusing on market competition as one criterion, found there are “clear winners and losers” (Taylor, 2009, p. 565). These findings demonstrate that market competition is a key factor driving innovation in the academic sector.

As with the commercial and health sectors, cost-containment has increasingly become a necessity in academia. Educators have been challenged to design and implement teaching and learning initiatives that are both academically and cost effective. The latter challenge has been viewed as a relatively new concept to educators, who in the past perceived their responsibility was to focus more on quality of education rather than on cost (Sparks, 2019). Reports of declining enrolment in higher education institutions and the associated socioeconomic and sociocultural impacts have prompted investigations into the escalating cost of tuition. Equitable access to higher education has been described as “the key to innovation” (Mulhern, Spies Staiger, & Wu, 2015, p. 3) by researchers tasked with reversing the trend of declining enrolment due to prohibitive cost. The academic sector has expanded its purview to include business trends as an essential indicator to monitor, thus motivating innovative teaching and learning practices (Friedman & Deek, 2003).

Consumers' expectations have motivated, perhaps necessitated, change in the academic sector. Accordingly, educators and managers have revised their teaching and learning practices to complement the learning styles of those described as digital natives (Livingstone, 2012) and techno-savvy students. As with the health sector, academia has acknowledged the need to empower their key stakeholder – the student. Concerted efforts to understand student attitudes, capabilities and behaviours have gained momentum. Consequently, pedagogical practices have been revisited and redesigned to include opportunities for applied learning as well as methods to incorporate students' extracurricular activities. This is viewed as a means to further expanding and enhancing teaching and learning opportunities which are better aligned with consumer expectations and behaviour (Hazelkorn, Coates, & McCormick, 2018).

1.2.7 Health Sector in the United Arab Emirates

The setting for this research is the academic sector of the United Arab Emirates (UAE). The focus is undergraduate health science programs. As the health sector is considered a key partner in the delivery of complete and current education, it is important to understand the healthcare system in the UAE.

In December 1971 seven emirates or sheikhdoms were consolidated to become the United Arab Emirates. Abu Dhabi is the capital of the UAE and home to the federal government. Dubai is the most populated emirate and perhaps the most well known due to rising interests in the financial and tourism sectors. Until as recently as the 1960s many tribes continued to live as Bedouins in the deserts, mountains and coastal regions (Margolis, Al-Marzouqi, Reve, & Leed, 2003). The discovery of oil and natural gas resulted in the UAE having one of the highest per capita incomes in the world (World Development Indicators, n.d.). As a result of exponential growth, the citizens of the UAE have witnessed a similarly rapid change in lifestyle. Emiratis, the national citizens of the UAE, represent less than 12% of the nation's population; expatriates comprise the remaining 88% (World Fact Book, n.d.). In the health and academic sectors expatriates were hired primarily from the UK, Europe, Australia, and North America. Professionals with expertise in each sector were engaged to facilitate the design, implementation and maintenance of this key infrastructure with the goal of replicating that of the western world.

The UAE health system is fairly unique in that it is not a single system but is comprised of several systems (Koornneef, Robben, & Blair, 2017). Abu Dhabi and Dubai have each established their own health authority. The federal Ministry of Health (MOH) administers provision and governance of health systems in the remaining five northern emirates. The MOH also retains responsibility for establishing the nation-wide health strategies.

The UAE healthcare system consists of both public and private sectors. The public sector is a comprehensive, government-funded healthcare system operating under the federal MOH (World Health Organisation [WHO], 2015). Complementing this is a rapidly developing for-profit private health sector. This is evidenced by facilities such as Cleveland Clinic Abu Dhabi, Imperial College London Diabetes Centre and the Harvard Medical School Centre for Global Health Delivery. In 2008, legislation was passed by the federal MOH, introducing compulsory health insurance to all citizens within Abu Dhabi emirate as well as the Northern Emirates (Younies, Berham, & Smith, 2010). In 2015, Dubai emirate passed a similar law mandating compulsory provision of health insurance to all citizens (Embassy of the UAE, n.d.). Health insurance is provided to all Emiratis at no cost. Employers are required by law to provide health insurance to all expatriate workers and their dependents. While there are several health insurance vendors available, the packages offered are very standardized and services offered are essentially the same amongst vendors (WHO, 2006). Benefits offered to expatriates range from basic to total health coverage.

To facilitate this developing health sector, the federal MOH, in conjunction with the health authorities, devised and mandated education and training standards for all healthcare professionals. These standards were in compliance with the framework recommended by the WHO (2017). The purpose of this model was to ensure and support the delivery of sustainable, effective and efficient healthcare (Ministry of the Health UAE, 2017). Expatriates form the majority of the health workforce; ensuring compliance with professional and MOH standards of practice was seen as critical in the development of a robust health system (Hannawi & Al Salmi, 2014).

As with other sectors, the healthcare system has experienced substantial growth and development. The Ministry of Health and Prevention (MoHAP) mission statement includes the goal to provide healthcare of the “highest standards of excellence and professionalism aiming at global leadership in health” (UAE Ministry of Health and Prevention, 2020). Initiatives to support this goal may be found in the deployment of an interoperable electronic health information system, referred to as *Wareed* (Arabic for vein; Moghaddasi, Mohammadpour, Bouraghi, Azizi, & Mazaherilaghab, 2018). This integrated information system was designed and implemented with the goal of connecting all government healthcare facilities in the seven emirates (UAE MoHAP, 2020). Training and support were provided to the health workforce during and following implementation by the system vendor (Cerner, 2020). To address the education and training needs of future health workforce, MOHAP recently mandated all postgraduate residency programs adopt a competency-based training framework (Ibrahim, Al Tatari, & Holmboe, 2015). This transition was intended to equip medical graduates with requisite knowledge and skills, including use of HI applications, thus preparing them for work in this ever-evolving health system. A similar mandate, addressing training requirements of undergraduate health science students, is not currently evident in literature or government policy. However, each program is required to meet regularly with an advisory council consisting of industry partners. The goal of this dialogue is to inform curriculum design as well as to highlight experiential learning needs.

1.2.8 Implementation of Informatics in the Commercial Sector in the UAE

Use of informatics in the commercial sector of the UAE has followed the same pathway and has achieved a similar, if not greater degree of success as its global partners. The UAE claims technology has indeed transformed the country. As an example, Dubai has been described as a “global city,” attributing this achievement to the successful implementation of information and communication technology (Bin Bishr, 2017). Government support may be found in its strategic plan, which includes the goal to create ‘smart’ and ‘digital’ cities (Government of the United Arab Emirates, 2021). Innovations in informatics have resulted in the UAE being recognized as a key strategic partner in many sectors, including commerce. Market competition is clearly an impetus to lead these innovations in the UAE.

The UAE has also employed cost-containment strategies as an innovative means to attract foreign investors. One such initiative may be found in the many ‘free zones’ present throughout the country, which levy minimal, if any, duties on imported goods (Baker McKenzie Habib Al Mulla, 2017). Dubai Healthcare City is an example of a free zone in the health sector. Initiatives such as the eCommerce strategy, recently launched in 2019, aim to reduce business costs while securely placing the UAE, specifically Dubai, within the global commercial sector (UAE Government, n.d.).

Addressing consumer behaviour and expectations of the diverse, multicultural population of the UAE presents a unique set of challenges and opportunities. As discussed previously, Emirati nationals form less than 20% of the population with the remainder being a compilation of global expatriate workers. Determination of consumer behaviour and identity in this multicultural setting becomes complex with the host nation representing the minority of the population. However, research suggests the UAE has assumed a lead role in creating and implementing communication and marketing strategies cognizant of the expectations of a diverse, multicultural consumer (Epps & Demangeot, 2013).

1.2.9 Implementation of Informatics in the Health and Academic Sectors in the UAE

Recent research focusing on the success of health systems reform in the UAE, including acceptance of HI, produced divergent opinions amongst healthcare providers (Koornneef et al., 2017). A study of EHR implementation in Dubai's public and private sector concluded that while progress is being made, no healthcare facility had achieved adoption of a complete, integrated, interoperable HIS (El-Hassan, Sharif, Al Redha, & Blair, 2017). It is conceivable the fragmented framework of this country's health system may have contributed to this outcome with key decisions being made independently by the three main governing bodies: MOH, Abu Dhabi and Dubai health authorities. This concurs with global reports of tentative acceptance of HI applications in the health sector.

Academia's response to HI is similar to that of its global partners. The inclusion of HI theory and training in undergraduate and postgraduate health science programs appears to have met with varying degrees of acceptance. This could, in part, be attributed to the international collection of educators, transferring their own perceptions, knowledge and expectations of HI onto the UAE academic setting. The academic sector is comprised of public and private institutions. Admission to government education facilities is reserved for Emirati nationals. Review of the academic catalogue of the largest institution of higher education in the UAE, and the setting of this research, revealed that of the eleven undergraduate health sciences programs on offer, only two included health informatics as part of its curriculum (Higher Colleges of Technology, 2017). This would further suggest undergraduate programs have not yet adopted the strategy to employ competency-based education and training as seen in post-graduate programs. The government sector has proclaimed its goal to produce a world-class healthcare system. The health sector has invested significantly in the design and implementation of an integrated HIS. In comparison, it is not clearly evident that the academic sector has kept pace with the needs and expectations of its two key partners. This scenario is the key focus of this research.

1.2.10 Concepts Driving Innovation in the Health and Academic Sectors in the UAE

Review of components driving innovation in the UAE health and academic sectors, specifically market competition, cost-containment and consumer behaviour reveals some similarities with its global partners. However, reflection of commerce, healthcare systems and academia in this Middle Eastern setting impose a unique set of parameters quite dissimilar from the western world. Elements that are possibly exclusive to the UAE setting include the diversity and fluidity of its population, wealth of the nation and a leadership focused on establishing world-class operations in all sectors, including health and academia. The meteoric growth in all sectors has demonstrated the country's resiliency and welcoming attitude towards innovation and change.

1.2.11 Health Sector

As discussed previously, the nation's health system has undergone major reform since federation. These reforms include mandatory private health insurance and increased development in both the public and private sectors. Fostering trust in the healthcare system is also a challenge facing this young nation. This perceived lack of trust might be attributed to legislation that supports Emiratis, their family and household members to travel abroad for health care (UAE Government, n.d.). While the intent of this legislation was to provide access to quality healthcare not currently available in the UAE, literature suggests the preference to travel abroad for healthcare still exists (Koornneef et al., 2017). Key drivers of innovation in this setting focus not only on quality, but also availability of healthcare and service. Market competition has had a significant impact on this scenario as prominent institutions from the UK, Germany, and the US establish healthcare facilities in this region. The opportunity to be an effective participant in developing this health sector coupled with the financial benefits offered by duty free zones suggests market competition is a key driver of innovation in this region.

The need to contain costs, even in this wealthy nation, has become a primary factor in the development of innovations in the health sector. Mandatory health insurance is one example of such an innovation, benefiting both the consumer and financier of health. The ability to fully support the escalating costs of developing and delivering healthcare had become difficult. The health insurance model was designed in response to this challenge (Hamidi, Shaban, Mahate, & Younis, 2014). Efforts to contain healthcare costs have been described as ineffectual, contributing this to the fragmented healthcare system and the lack of competition amongst health insurance companies (Koornneef et al., 2017). Strategies aimed at improving health costs and economies continue.

The impact of consumer behaviour and expectations on the development of innovations in the health sector is comparable, on some levels, to its global partners. An additional and possibly unique concept challenging innovation here is the large expatriate population. This demographic represents a diverse, multicultural group with equally diverse socioeconomic status. It is the goal and challenge of the health sector to be cognizant of the needs of labourers, professionals and leaders who have all contributed to the brisk development for which the UAE has become famous.

1.2.12 Academic Sector

Higher education has also witnessed exponential growth and development, attributed mainly to expansion of the private sector (Hijazi, Zoubeidi, Abdalla, Al-Waqfi, & Harb, 2008). Examples may be found in the establishment of Knowledge Village and Dubai's University City, each enterprise hosting satellite universities from leading institutions in Europe, Canada, UK, US, and Asia. A listing of some international universities in the UAE includes: the British University in Dubai, Heriot-Watt University-Dubai, and New York University-Abu Dhabi. Market competition is a key impetus for innovation in this environment with offerings including hybrid and distance education, allowing expatriates to continue their studies on return to their home country. These educational zones are another example of free zones, affording each institution benefits similar to those in the commercial and health sectors. As a result, higher education has become more affordable and achievable, drawing students from the UAE and surrounding Gulf countries.

However, there remains a need to contain costs in the academic sector. This scenario is similar, in some aspects, to that of its global partners. Recruitment and retention of qualified educators has contributed significantly to the rising costs of education in the UAE (Hijazi et al., 2008). Expansion in the private sector has had a positive impact on cost containment providing greater opportunity and choice in graduate studies for citizens and residents of the UAE (Bhayani, 2014).

Similar to its global partners, consumer behaviour and expectations have had a significant impact on the UAE academic sector. Emirati graduates must compete with an international body of expatriate graduates for key positions in each sector of the country. Industry partners are strongly encouraged to support ‘Emiritization’ (hiring UAE nationals). However, research involving stakeholder assessment of national and expatriate graduates suggests the latter excel in intellectual development and critical thinking (Bhayani, 2014). Incorporating these findings in curriculum and experiential learning strategies dictate the need for innovation to address the behaviour and expectations of these consumers.

1.3 Research Background

1.3.1 Research Setting

The setting for this research is a tertiary academic institution in the United Arab Emirates (UAE). The institution is comprised of a network of seventeen campuses throughout the seven emirates (Higher Colleges of Technology, n.d.). Clinical and allied health science programs are offered at nine campuses. The Higher Colleges of Technology (HCT) is the nation’s largest tertiary academic institution. Accreditation has been sought with organisations from Canada, the United Kingdom, United States and Australia. This scenario presented as an incredible opportunity to adopt best practice from recognized world leaders. The academic and health sectors, once viewed as lagging behind other parts of the world, have invested heavily in human and physical resources to remedy the situation. In the academic sector, faculty were tasked with developing programs and curriculum. During this planning and design phase of the 2000s, faculty were essentially working with a blank slate, a situation rife with opportunity. It was in this environment that I became aware of the uniqueness of the setting and situation. Pathways taken to develop programs and curricula of relevance to this Middle Eastern society and culture were of particular interest.

1.3.2 *Motivation for the Study*

The topic of health informatics has gained the attention of a wide range of stakeholders: legislators, financiers, healthcare providers and managers, the patient, to name but a few. Some literature claims HI has the ability to actually reform health care (Kök, Basoglu, & Daim, 2016); other literature describes a less than optimal uptake of this resource (Rigby & Ammenwerth, 2016). Still further literature suggests there is little to no evidence proving HI has had a positive impact on health outcomes (Agha, 2014). It is because of this continuing litany of conflicting dialogue, that I began to question academia's role in and contribution to this situation. The health care industry had demonstrated its commitment to reducing costs and improving health outcomes by adopting the latest innovations in health information technology (Mettler & Vimarlund, 2009). However, as a partner and stakeholder, I was curious about the extent to which academia had shown a similar level of commitment and support. Were our graduates equipped with the requisite HI knowledge and competencies that industry expected and required? Perhaps academia's production of an ill-equipped graduate was part of the problem. Review of the health science programs of which I was faculty, suggested we had not kept pace with the advancement of HI. Eleven programs are offered within the Health Sciences division. A review of the academic catalogue, which provides a listing of curriculum offered in each program, revealed only two of the eleven schools included health informatics: baccalaureate programs in health information management and nursing (HCT, 2017). In the absence of HI theory and training, it was highly possible students in allied health programs such as pharmacy, medical imaging, laboratory medicine, and healthcare leadership were receiving an incomplete and outdated education. The impact this had on academia, our commitment to our students and to industry partners was of key interest and became the impetus for this study. Therefore, a study was designed to investigate the perceptions, preparedness and future plans of relevant stakeholders, regarding HI and in particular, its inclusion in health science curricula at a post-secondary institution.

This research investigates stakeholder perception, motivation and concerns regarding health informatics, particularly, its inclusion in health science curricula. A stakeholder is described as a constituent of an organization (Wagner, Hassanein, & Head, 2008). Accordingly, stakeholders of health informatics education are those that are affected by it.

This study examines the factors contributing to the delay in developing health informatics curriculum in health science programs at this academic institution. Such hesitancy toward applications of health information technology is common. Ash reports on "adoption and diffusion rates" (Ash & Bates, 2005, p. 8) of health information systems, suggesting a significant gap persists. Health informatics applications can be tailored to meet the needs of all health programs offered at this facility. Accordingly, attention was paid to commonalities and differences in beliefs of stakeholders within each division. Knowledge gained from this research will facilitate the development of relevant health informatics curricula to support each speciality within the health science division.

1.4 Structure of Thesis

The thesis consists of six chapters, each describing a specific component of this study. The following is a description of contents addressed in each chapter.

- Chapter 1 introduces the topic of the research and the overview of the thesis. This includes brief rationale for the research and the setting in which the study takes place.

- Chapter 2 provides a critical review of literature pertaining to HI. The stakeholders of this technology are identified; salient roles, responsibilities and expectations are discussed. This chapter includes a review of suggested advantages and disadvantages of HI in industry and academia. Also included is a review of enablers and barriers to HI from the perspective of healthcare, government, academia and community. The status of policy pertaining to the development and implementation of HI applications is discussed as well as the status of curricula at a regional and global level. Each of these elements provided a framework for which to examine the research topic.

- Chapter 3 describes the aims and methods used in this study. The methodological approach, including the rationale for using thematic analysis as the guiding framework, is explained in detail. The theoretical framework for the study is identified. Research design, including justification for selecting focus groups as the means of data collection and analysis, are described. Embedded in this is a discussion of reliability, validity and ethical issues that might have resulted from this study. The process of analysis is described in detail.

- Chapter 4 presents the findings from the qualitative analysis. Discussion of findings from the perspective of consumers and providers of HI tuition is included specifically addressing perception, preparedness and future plans pertaining to HI. Findings, which identify the roles and responsibilities of the stakeholders of health sciences education, are presented.

- Chapter 5 is a discussion of findings within the context of relevant literature. Similarities and differences between and amongst participant groups are identified. The significant role of the focus group process is identified and discussed in relation to the findings. This chapter concludes by relating the findings to the research question, enabling a greater understanding of perceptions, preparedness and future plans pertaining to HI of stakeholders in this setting. Consideration of these findings and discussions are compared to other recent research investigating HI curriculum.

- Chapter 6 concludes the thesis with a summary of the key findings and noteworthy elements of this research. Methods to disseminate these findings are discussed as well as strategies to initiate recommendations made as a result of the study.

1.5 Conclusion

A key finding of this study was the powerful impact of communication. Focus group forums enabled participants to share insights, concerns and ultimately future plans pertaining to health informatics and how it might be incorporated in teaching and learning in this academic setting. This outcome is described in detail in further chapters of this thesis.

Chapter 2 – Literature Review

2.1 Introduction

Health informatics has assumed a prominent role in the healthcare environment. Proponents assert integration of information technology in health will have a significant impact on quality and hence, costs of healthcare delivery. Empowering patients and healthcare providers with relevant, accurate information are cited as key elements contributing to these improved health outcomes (Ammenwerth, Schreier, & Hayn, 2009). Opponents counter that little evidence exists to substantiate these claims, suggesting return on this considerable investment remains elusive (Vest & Gamm, 2010). Academics attribute the lack of trained health faculty as one contributing factor to this deleterious result (Borycki, Househ, Kushniruk, & Kuziemsky, 2011). Review of literature would suggest this debate has yet to come to a satisfactory conclusion. The consequences of this debate are the focus of this research project.

The intent of this thesis is to gain an understanding of stakeholders' perception and current knowledge relating to health informatics. It is anticipated this information will be beneficial in development of health informatics curricula at the college in the United Arab Emirates (the research setting) as well as other regional and global partners in the academic sector. This chapter considers literature on the definition, purpose and current integration of HI into curricula for the education and training of future healthcare professionals. Concepts relating to participants' perceptions of HI, including expectations and requirements, are addressed. The adoption of information technology in other industry sectors is compared to that of the health and academic sectors. The manner in which HI implementation and education has varied globally amongst health and academic sectors is also explored. This literature review addresses the following research questions:

- What are the perceptions of stakeholders (faculty, students, alumni, program administration) regarding an academic health informatics module?
- What are the barriers to and facilitators of the integration of an academic health informatics module?

2.2. Search and Selection Strategy

2.2.1 Selection of Literature

A systematic search of academic literature was done using defined keywords. The following resources were selected for identification of relevant literature: University of Bath online library (The Library), Embase, PubMed and Medline. The primary source for the literature search was The Library as it was determined this would provide the greatest access to full text articles. Embase and PubMed databases were accessed through The Library. Additionally, a selection of relevant articles was hand-searched by accessing Google Scholar.

The initial literature search covered the period from 1995 to 2013. This was extended to August 2020. Literature search was done using a combination of the following MESH terms, free-text words and entry terms: health informatics, medical informatics, biomedical informatics, curricula, curriculum, design, model, education, competency, training, faculty, perception, degree, postgraduate, technology, allied health, clinical health, electronic health record, health information systems, health reform, UAE, United Arab Emirates. Reference lists within published research articles were also searched manually for relevant literature.

In addition, a review of grey literature including reports and publications from government agencies, health and academic sector organizations and key international sources was done. These sources include: the WHO, the World Fact Book, UAE Ministry of Health, UAE Government, World Development Indicators, United Arab Emirates Ministry of Health and Prevention (MOHAP), Higher

Colleges of Technology (HCT), Dubai Healthcare City, Dubai Knowledge Village.

Health/medical informatics programs listed with the International Medical Informatics Association (IMIA), American Medical Informatics Association (AMIA) and Digital Health Canada were reviewed for suitable inclusion. This search provided relevant articles discussing graduate programs and graduate competencies in health/medical informatics.

The first search, using the term ‘health informatics’ produced tens of thousands of results. A refined search was then repeated using the following filters:

- Date published
- English articles
- Source
- Full text only

The remaining keywords were searched individually. Search terms ‘design’ and ‘model’ produced zero relevant results and were deleted. Limitations of English articles from 1995 onwards were set and a final search performed. A total of 9769 articles were found. A ‘Search History’ was then displayed and relevant articles hand-searched, specifically those addressing health/medical informatics education.

2.2.2 Inclusion and Exclusion Criteria

Articles that discussed health/medical informatics education for clinicians, allied health professions and managers were included. Resources that addressed teacher’s beliefs regarding blended learning and use of technology as a mode of delivery were also used to frame the search. Other inclusion criteria addressed the graduate outcomes in health/medical informatics education. Articles focusing on knowledge, epistemological beliefs and skills, and that listed detailed information on health informatics education were included. Resources were dismissed if the program was at the diploma or certificate level as the focus of the research was on bachelor of applied science programs as a minimum qualification. Articles dealing with veterinary medicine informatics and the revenue cycle of informatics were excluded. Literature involving informatics education for patients and other consumers was excluded. Table 1 provides a summary of the inclusion and exclusion criteria applied to the literature search.

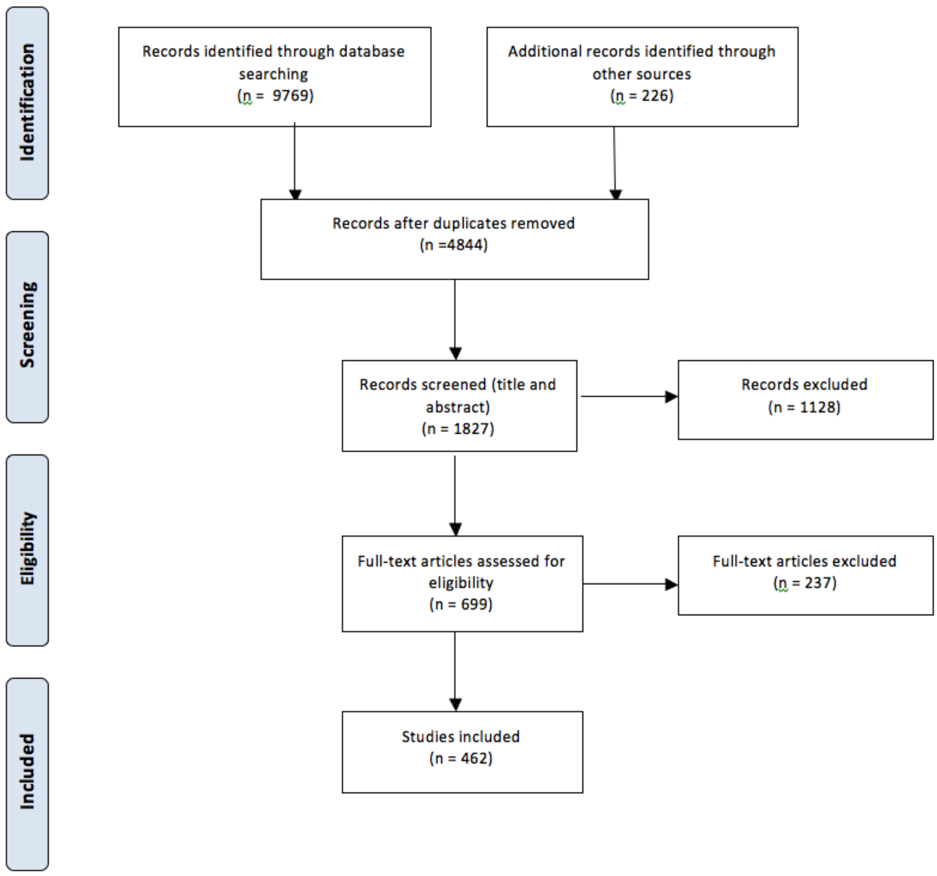
Table 1: Literature Search Criteria

Inclusion Criteria	Exclusion Criteria
• Health informatics • Medical informatics • Informatics/commerce • Curriculum • Education • Competency • Informatics perception • Allied/clinical health • Under-/postgraduate • United Arab Emirates	• Veterinary medicine informatics • Revenue cycle of informatics • Dated prior to 1995 • Non-English articles • Certificate HI program • Diploma HI program • Consumer informatics education

2.2.3 Process of the Structured Literature Review

The PRISMA methodology was adopted for the literature review as shown in Figure 1 (Moher et al., 2009). Initial screening of articles included a review of abstracts, contents and conclusions to determine suitability and eligibility. Publications not meeting the selection criteria were deemed ineligible and therefore excluded. The second phase of screening involved a more in-depth review and analysis of the literature.

Figure 1: Process of the Structured Literature Review



Source: Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) Flow Chart of Literature Search Result (Mohr, Liberati, Tetzlaff, & Altman, 2009).

2.2.4 Quality Appraisal

Specific selection criteria were established as a framework for the literature search. This was done to ensure selected articles were relevant, valid and in alignment with the aims and purpose of this research. Academic, peer-reviewed articles were given preference. Reference to information from grey literature was included only from known government, academic and global organizations. Due to the exponential growth of information and communication technology in the health and academic sectors, it was deemed important to include date of publication as search criteria. The rationale for selecting this timeframe (1995 to 2020) was two-fold. The focus of the study was recent developments in HI curriculum occurring from 2000 onwards.

Literature dating from 1995 would provide valuable legacy information; however, as mentioned, the focus was on current needs within the academic sector.

Assessing the quality of evidence in literature is facilitated by the use of guidelines such as that found in the GRADE (Grading of Recommendations, Assessment, Development and Evaluations) framework [Guyatt, 2010]. This involves a structured assessment and ranking of each article reviewed, determining the level of outcomes such as risk of bias, imprecision, inconsistency, indirectness, and publication bias. While these outcomes guided the review and appraisal of literature, it was not possible to perform this kind of quality assessment in its entirety due to the lack of academic evidence of HI implementation in the UAE. The literature that does exist indicates interest in HI implementation within the health sector is quite high. However, relatively little research has been conducted that addresses perceptions of and competencies with HI from the perspectives of stakeholders within the academic sector in the UAE. The goal of GRADE is to enable grading of the certainty in evidence in absolute terms. Due to the lack of literature found and therefore the limited degree of evidence of certainty, this type of quality appraisal was not undertaken.

2.2.5 Results

The final number of articles screened was 699; 462 articles met the inclusion criteria. Table 2 shows a summary of selected literature. Thorough review of the selected papers enabled the classification of literature into key topic areas. The findings of the literature review are summarized under these headings.

Table 2: Summary of Selected Literature

Topic	Quantity of References Used
HI Education	171
HI Curriculum	94
HI Competency	78
Diffusion of Innovation	28
Epistemology	24
HI Perception	23
Teachers' Beliefs	19
Thematic Analysis	17
Informatics/Commerce	8
Total	**462**

2.3 What is meant by health informatics?

HI has many designations. Medical and biomedical informatics are common labels that are often used interchangeably. However, as the field has evolved, a framework has emerged which clearly delineates and defines the scope and purpose of each entity. Biomedical informatics (BMI) is seen as the foundational core encompassing a myriad of applications across the health spectrum. BMI is further divided into two key components: bioinformatics and HI. Bioinformatics comprises informatics applications beginning at the molecular level. HI, with its focus on individual and population health, includes medical and public HI. The basic and common element found in all models of informatics is data – the foundational piece in the wisdom hierarchy. Accordingly, each field within the BMI framework uses data to support research, education, and decision-making with the common goal of improving health (Kulikowski et al., 2012). Academia, a key partner in these endeavours, is responsible for assessing and addressing the educational needs of both faculty and student. Establishment of a concise, relevant and standardized definition is the first pillar in understanding stakeholder perception of HI in academia.

2.3.1 Defining Health Informatics

The field of HI is a relatively young science to be introduced into the health sector. In basic terms, HI is the integration of information and communication technology with health care and service. The ultimate goal is sustainable improvement in health outcomes. Development of information systems in the health sector has facilitated storage, retrieval and sharing of health data and information. Health information technology (HIT) has continued to evolve and is considered to be the fundamental element within the discipline of HI (Hersh, 2002). In its most general sense, HI has been defined as "the field that is concerned with the optimal use of information, often aided by the use of technology, to improve individual health, health care, public health, and biomedical research" (Hersh, 2009, Discussion section, para. 3). This interpretation clearly supports the prominent status HI has earned over the last few decades. It would also explain why several factions of healthcare professionals have developed its own salient brand of informatics. Medical, nursing, pharmacy and public health informatics are examples.

Defining HI is complex. The end-users represent a group with vastly different educational backgrounds and professional responsibilities. Also, many professions within the health sector have developed their own definition pertaining to their scope of study and practice. A definition offered as an introduction to HI is:

> *A field of information science concerned with the management of all aspects of health data and information through the application of computers and computer technology. (Fenton & Biedermann, 2014, p. 4)*

This definition encompasses the multifaceted nature of HI. The concept of data and information management can be further expanded upon to include analysis, use and dissemination of data essential in decision-making performed by all stakeholders (U.S. National Library of Medicine, National Institutes of Health, 2004). Academia is responsible for ensuring all components of this definition align with curriculum and training. This research investigates stakeholders' understanding of this definition, their perception of HI and how this concept can be incorporated into curricula. The comprehension and perception of students and alumni, often described as 'digital natives', may differ from that of faculty and academic management (Mohr & Mohr, 2017). This potential variance in perception, based on each groups' understanding of the definition of HI, may represent a barrier to acceptance and implementation of this concept in academia. In the absence of a clear, standardized and accepted definition it is possible that curriculum development may suffer a lack of focus.

Another definition incorporates the concepts of health care, education and research with "cognitive, information-processing, and communication tasks" (American Health Information Management Association, 2014). This definition is significant and possibly unique. The information system allows not only for the retrieval of health data and information, but also for intuitive processing of this data. Clinical decision support systems (CDSS) are an example in which a patient's clinical and demographic profile, embedded in the EMR, is matched to a computerized knowledge base. This application generates patient-specific recommendations which guide and support essential decision-making practices (Garg et al., 2005). Providing education and training, which encompass this vast aspect of health, is the essential and evolving task assigned to academia.

The importance of competent use of applications such as CDSS, and the definitive impact on quality health outcomes, is obvious. It would therefore follow that all health science students, particularly those in clinical health programs, require the knowledge and skills to properly understand and use this resource. Assessment of stakeholders' perception of this and other applications of HI is the focus of this research. Inherent in this investigation is the goal to identify barriers to and facilitators of the integration of this theory and practice into curricula. Healthcare is an interdisciplinary field. However, traditionally health professionals have been described as functioning in silos. The fundamental premise of HI relies upon an integrated network of professionals (Dalrymple & Roderer, 2010). It is counterintuitive, therefore, to suggest HI focus on the needs of each health profession in isolation. Perhaps the customary practice, possibly preference, of health professions to work in silos has contributed to limitations in perception, knowledge of and competence with HI. This research examines these concepts and the potential impact this might have on HI curriculum development. In response to this, it might be advisable for the academic sector to shift its focus to interdisciplinary, integrative teaching to properly prepare future healthcare professionals for their ever-evolving scope of practice.

2.4 What is the Purpose and Function of Health Informatics?

The common and essential thread connecting all patrons of health is information. Legislators, policymakers, payers, educators, caregivers, patients and their community all rely on complete, accurate and current information to support critical decision-making. The science of HI has emerged in response to this fundamental, often urgent, need for valid and reliable information. Some have suggested HI will be responsible for reforming healthcare, an outcome highly anticipated on a global basis (Clancy, Martin-Anderson, & White, 2009).

Considering definitions discussed previously, the purpose and function of HI should be self-evident. However, Hersh (2009) claims this field of science continues to be "poorly understood and not even agreed upon by academics and professionals in the field" (Abstract section, para. 2). What appears to have been a simple concept in theory has become complex and difficult to manage in practice. It is conceivable the lack of complete, pragmatic understanding of the definition of HI has contributed to the inability to fully operationalize this resource in academia.

The responsibility of HI is to ensure usability and functionality meets all stakeholders' needs. Policies, procedures and professional codes of ethics must reflect the overlapping and integrating purpose of HI. These foundational elements provide essential guidance to both the health and academic sectors. It would be difficult to achieve and sustain the proposed purpose of informatics in the absence of this framework (Gell, 2001). Exploration of the perception of functionality and usability within the HI domain, especially those of faculty and academic management, may provide valuable insight into ideas which both enable and resist the integration of an academic HI module in curricula.

2.4.1 Applications of Health Informatics

Primary examples of health information technology (HIT), and thus HI, are the electronic health record (EHR), and the electronic medical record (EMR). Various adaptations may be found at every level of the health sector from regionalized and national health networks to individual physician practices. These terms are often used interchangeably; however, significant differences exist in purpose and function. The EHR refers to the health information system integrating several health facilities. Accordingly, a patient's health information may be stored and retrieved by multiple providers in multiple settings. This application of HI connects the patient with their health information and their team of healthcare providers across the care continuum. The EMR is organisation-centric and forms the legal document between the patient and their care providers at that point of care only. EHR and EMR functions include: clinical decision support systems, computerized physician order entry (CPOE), and clinical documentation applications (Garets & Davis, 2006).

The benefits of this technology might seem obvious and yet adoption remains sporadic amongst key members of the health sector (Christodoulakis, Asgarian, & Easterbrook, 2017). Health science ‘practitioner-academics’ often transition between the health and academic sectors, acquiring teaching knowledge and skills as the next phase of their career (Wilson, Wood, Solomonides, Dixon, & Goos, 2014). It is feasible the perception of HI developed while working in the health sector has followed these professionals into the academic sector. If the uptake of HI in the health sector has been erratic, as literature suggests, this may help to explain the similarly tentative acceptance in academia.

Health informatics applications have developed ranging from robotic surgical assistance to the ubiquitous electronic health record. The latter is of key importance to this study. The majority of healthcare professionals will use it; literature suggests a decided minority is sufficiently educated and trained to do so (Graham-Jones, Jain, Friedman, Marcotte, & Blumenthal, 2012). Research of medical students’ exposure to electronic health records found that while the curriculum existed, students were rarely allowed to utilize this resource (Hammoud et al., 2012). Anecdotally, health science students in the UAE have reported a similar situation. The impact this may have on quality of health outcomes and underpinning causal factors are a concern and have been incorporated in this research. Health information stored within the EMR/EHR is the fundamental and critical element connecting all sectors of health and is therefore considered a primary example of HI. Including these concepts in curricula is essential to ensure complete, relevant and contemporary education.

2.4.2 HI Functionality and Usability

As awareness of informatics potential increases, end-users have developed unique and purposive definitions, applications and associations. The EHR allows these exclusive groups to enter and share information relevant to their scope of practice. Literature suggests the adoption of HI within certain health professions is increasing (Haux, 2010). Nursing, pharmacy and medical informatics are examples. An objective of this research is to determine student readiness upon graduation. Inherent in the assessment of this preparedness is the need to understand current and future developments in HI within their chosen profession. Knowledge gained from this assessment would establish a basic framework, identifying elements for inclusion in curriculum design.

Medical informatics allows clinicians to request diagnostic and therapeutic interventions while monitoring progress and outcome. The intuitive constructs embedded in the EMR provide data and information to support decision-making, thus improving health outcomes while reducing costs and mitigating risks. Enhanced information and communication technology (ICT), an integral component of the EMR, supports provision of education and support by connecting the patient and family to their healthcare team. Further, ICT applications within the EHR allow clinicians and other health professionals across the care continuum to share knowledge and innovations (Adams et al., 2014). This collaboration contributes to standardized best practice, improved health outcomes and enhanced opportunities to teach and learn.

Nursing informatics optimizes the integration of ICT with nursing practice. Information collected during and following a patient's episode of care is used to monitor, evaluate and thus determine standards of best practice. As with medical informatics, nursing informatics is interdisciplinary, supporting teaching and learning opportunities for all members of the healthcare team, including the patient. The American Medical Informatics Association (AMIA, n.d.) suggests nursing informatics promotes, “the health of people, families and communities worldwide” (AMIA, n.d., para. 1).

Pharmacy informatics uses health information technology to acquire, store and distribute medications. EHR technology further supports monitoring of quality, risk and utilization components related to medication procurement and administration. A key benefit of pharmacy informatics often reported in literature is “safe and effective medication use” (White & Hohmeier, 2015, para. 4). Associated with this is the ability to monitor and analyse events contributing to medication errors. Pharmacy informatics provides valuable opportunities to educate and support the patient, family and healthcare providers.

Public health informatics utilizes data stored in the EHR to monitor disease incidence and prevalence, with the ultimate goal of improving health and wellness. Communication tools within the EHR provide opportunities to monitor, support and educate individuals and communities. A challenge facing this sub-group is health literacy (Kukafka & Yasnoff, 2007). Equitable access to healthcare and health information continues to be problematic from a socioeconomic perspective. The societal and cultural impact of HI is discussed further in this chapter.

Each professional group has its bespoke purpose, requirements and expectations. These selected professions represent the core programs offered at the college as well as key partners with which participants of this study would interact. These HI features provide an outline of essential functionality, which in turn, should inform curriculum design and implementation. Literature acknowledges a gap persists between competencies met and required, thus providing the impetus for this study (Bredfeldt, Awad, Joseph, & Snyder, 2013).

2.5 Policy and Standards

Establishing policy and standards, unifying government and academia, is likely to be critical to the successful uptake of this fundamental tool. Initial literature search specifically addressing government initiatives to guide health informatics design and implementation, including both the health and academic sectors, produced limited results. The International Medical Informatics Association (IMIA) initiated this process in 2000 and more recently produced revisions to their educational recommendations in 2007 (Mantas et al., 2010). IMIA Key Principles acknowledge that, "every profession in health care even at an early stage needs some core biomedical health informatics (BMHI) education (Mantas et al., 2010). This document provides a recommended pathway for academic institutions, and if followed, would achieve an international, standardized approach to health informatics tuition. These guidelines provide valuable direction to this research.

Government is an influential partner in this debate. Little activity may occur without clear directives in the form of sanctioned policies from the government. Early research suggested a dearth of HI policy existed (Goldsmith, Blumenthal, & Rishel, 2003). It was possible, therefore, to design a health information system that was not integrated, effectual or safe. Further study found that little attention had been paid to the "appropriateness of design and integrity of functioning of health informatics" (Rigby, Forsström, Roberts, & Wyatt, 2001, para. 2). The unintended, unwanted outcome of this scenario was reports of unsuccessful, often failed, HI implementations.

Considering the massive amounts of time and money spent to produce such average results could conceivably contribute to the perceptions of and resistance to this innovation in healthcare. This scenario has been described as the productivity paradox, wherein promises of efficacies in process and outcome failed to materialize.

Investigation of this situation, initiated by the UK Department of Health, suggested time and patience are essential to HI success – two concepts particularly challenging to policymakers (Wachter, 2016). Leaders of similar implementations in other sectors reported waiting 10 years before realising a return on this considerable investment. Leveraging this same expectation on healthcare governance could clearly represent many challenges. Consumers and providers of health are often not in a position to wait, viewing the pursuit and maintenance of health with some urgency. Reviews led by Doctor R. Wachter (2016), and more recently by Doctor E. Topol (2019) advised government to include the academic sector in HI strategic and operational planning (Topol, 2019; Wachter, 2016). Each review concluded with recommendations that governmental policies be developed, specifically addressing the needs of health sciences educators and students.

By addressing the educational and training needs of current and future healthcare professionals, the government and health sectors might well achieve successful, sustainable acceptance and use of the many HI applications (Topol, 2019). The inclusion of academia in these recommendations would seem to complete the cycle. The academic sector was now being recognized as an essential component of this health information lifecycle. Graduate and post-graduate HI programs had previously been developed with the goal of producing health informaticians. However, this advisory committee acknowledged the distinct need to include health informatics curricula within academic programs thereby ensuring graduates were both knowledgeable of and competent with the many applications of digital health. Improving graduate preparedness would surely impact this group's perception of HI. The availability of trained, knowledgeable faculty and academic leadership is essential to this scenario. By inviting the academic sector to these discussions, this need would surely be addressed. It is possible this strategy may even reduce the ten-year waiting period inherent in the productivity paradox.

The need for comprehensive policy is essential to properly define the HI framework, purpose and functionality. In addition to policy directing the use of HI, information privacy, security and governance are also core considerations for inclusion when developing this high-level policy. These concepts are of key importance to every healthcare professional. The recognition of academia as a key stakeholder and partner, responsible for policy addressing HI design, implementation, use and evaluation is of key significance to this research.

2.6 Local Application of HI Standards

Integral to the development of international standards, is the need to ensure application at the local level. Accordingly, academic institutions have been advised to incorporate recommendations, such as those developed by IMIA, to ensure they appropriately meet stakeholders' needs. Benchmarking local initiatives with international best practice has been recommended to ensure IMIA's key principles are adapted correctly and effectively. McCullagh and Murray (2006) recommended benchmarking health informatics "with a focus on Computing Science" (McCullagh & Murray, 2006, p. 37). Their research identifies the importance of including various academic disciplines in the development of health informatics curricula, emphasizing again the complex relationship of this discipline's stakeholders. This recommendation is relevant to this research, as all health science disciplines within HCT are stakeholders. Including other programs such as Information Technology and Business would ensure an interdisciplinary approach to curriculum design, thus aligning with industry need. This concept of merging disciplines to address teaching and learning strategies may be influential in reducing barriers to the integration of an academic health informatics module.

The academic sector of the UAE is comprised of public and private institutions. Academic leadership consists of Emirati nationals as well as a large contingent of international expatriates. This membership represents a richly diverse assembly of experience with and knowledge of standards pertaining to curriculum design, implementation and evaluation. Initial search for literature addressing HI curricula in this region produced no results. At the time of writing, however, development of associations such as the Middle East and North African Health Informatics Association (MENAHIA) have been established with the goal of addressing the HI needs of both the academic and health sectors (Al-Shorbaji et al., 2018). Assimilating best practice from regional partners to address current and future need at the local level has the potential to significantly influence and facilitate the incorporation of HI curricula.

2.7 Perceptions of HI

The first research question aims to explore and possibly identify the perceptions of stakeholders regarding an academic health informatics module. The process of developing perception of a concept involves selection, organization and interpretation of information (University of Minnesota, 2016). Salience of information is integral to selection, having screened out information viewed as uninteresting and/or insignificant. Perceptions are then sorted and organized according to one's established cognitive framework. The process concludes with interpretation of perceptions, often founded on prior experiences.

To determine barriers to and enablers of the integration of health informatics in health science curricula, the goal of the second research question, it is important to first understand stakeholder perception of this concept. The stakeholders identified in this research are health science program management, faculty, students and alumni. Investigating participant perception, possibly isolating contributing factors, would facilitate an understanding of the relevance and importance assigned to HI, and subsequently, to its integration in curricula.

Perception involves evaluative judgements, primarily constructed on the basis of current, salient contextual and evolving knowledge about a specific concept or object (Chaiken & Baldwin, 1981). Perceptions are further described as being well or poorly defined. Development of one's perception may occur as the result of the projection of another's perception. Considering this definition, and the close relationship between the health and academic sectors, it becomes easier to understand how perceptions evolve and develop. As academic management and faculty reportedly transition from a career in healthcare to academia, as practitioner-academics, perceptions established while working with HI in industry could reasonably be projected onto their perception of HI relevance and significance in education. Continuing with this theme, the perceptions of these two groups of participants could conceivably then be projected onto students and alumni. Health science students transition between the academic and health sectors during clinical placements and internships. This learning experience could also contribute to their perception of HI. Understandably, during these periods of exposure to HI, this group of stakeholders may develop a well- or poorly defined perception of the usability and functionality of this resource.

A study performed in the Middle East region indicated the majority of health science students perceived HI to be important and relevant (Khader et al., 2018). However, less than one-third of the students surveyed felt their academic institution properly supported HI education and training. Interestingly, the participants of this research project, particularly students and alumni, shared a similar perception. This seemingly paradoxical scenario was further complicated by the belief that the UAE health and academic sectors shared a collaborative, synergetic relationship. Accompanying this perception was the assumption that industry need had been communicated to those responsible for educating future healthcare professionals. As noted, development of perception is influenced by the interpretation of information. Authentic, transparent communication amongst stakeholders has the potential to significantly influence the progression of perception. It is possible that poor communication between the health and academic sectors, explicitly addressing HI usability, competency, and responsibilities contributed to the inconsistent interpretation and poorly defined perception described by these students. This theme is explored in more detail in the Findings section of this thesis.

Academic management and faculty perception of HI may have evolved, following a somewhat different pathway. Literature notes a significant percentage of ‘practitioner-academics’ are self-taught regarding HI applications, often acquiring their knowledge of the EHR during clinical rotations (Chung & Cho, 2017). This scenario could conceivably result in faculty now becoming the learner, acquiring knowledge and skills at the same time as their students. This ambiguity of roles, coupled with unclear, undefined goals would certainly contribute to perceptions developed by these members of the academic sector.

This scenario aligns with the previously noted student perception that academia does not provide the support required to ensure current, complete HI education. As a result, students, academics and practitioners are neither comfortable nor confident with their knowledge of and competency with HI applications (Scott, Rundall, Vogt, & Hsu, 2005). In the absence of full information, thus knowledge of a concept, the potential to develop a poorly defined perception exists. Confusion and lack of confidence in one’s understanding of roles, responsibilities and abilities would similarly facilitate a negative, poorly defined perception of this concept. The impact of this scenario on the development and use of curricula focused on HI usability, functionality and governance is of key importance to this study.

2.8 Enablers and Barriers to Integration of HI **Curricula**

The second research question examines the barriers to and facilitators of the integration of an academic health informatics module. Review of literature discusses the status of HI curricula in academia in North America, Europe and the Middle East.

2.8.1 Barriers to Integration of HI Curricula

The academic sector is responsible for providing complete, contemporary and sustainable education to its constituents. This group represents both consumers (students and alumni) as well as providers (faculty and academic management) of this knowledge and training. As noted, much has been written about the progressively evolving implementation of health informatics in the health sector. Search of literature has also provided ample discussion of academia's persistent hesitancy to maintain pace with this innovation (Kushniruk et al., 2014). It should be noted, however, that lesser evidence of similar investigations in the academic sector could be found specifically involving the Middle East region.

The rationale for this hesitation is comprised of multiple factors including limited time, lack of well-defined and well-understood definition, and a multitude of assumptions pertaining to roles and responsibilities. An example is the belief that formal HI education is unnecessary for an already techno-savvy generation of students (Strauss, 2010). Another assumption is the perception that health students acquire this knowledge and skill, informally, during clinical placements within the health sector, thus relieving academia of this duty. Literature refuting this model describes a blurred concept of responsibility, suggesting the health and academic sectors are equally complicit in this less than satisfactory acquisition of knowledge and skills (Welcher et al., 2018). By denying students access to the electronic health record during practical training, this future health workforce is entering industry ill equipped and unprepared.

This scenario persists, despite open access to educational guidelines provided by the International Medical Informatics Association (IMIA) (Mantas et al., 2010). IMIA revised its educational recommendations recognising the diversity and complexity of the health-academic ecosystem. Accordingly, two categories of learning outcomes have been created. These two categories focus on the learning and training needs of the current and future health workforce. Further guidance in HI curriculum development can be found which specifically focus on evaluation methodologies (Ammenwerth et al., 2017)

If, as literature suggests, perceptions transition with the professional from their role as practitioner to academic, it may be feasible that decisions to accept or resist the use of HI follows a similar pathway. Continuing with the concept of practitioner-academics, it is possible that HI perceptions, knowledge and competency acquired in the former role inform and guide the development of these concepts once transitioning to the latter role. Elements identified as barriers to HI integration in the health sector may similarly represent barriers to acceptance in the academic sector. A study performed in Saudi Arabia categorized barriers to HI adoption in healthcare, with the goal of facilitating understanding and determination of solutions (Khalifa, 2013). A listing of these categories is included in Table 3: Categories of Barriers to Health Informatics.

Table 3: Categories of Barriers to Health Informatics

Barriers	Constituents
Human Barriers	• Healthcare professionals
Financial Barriers	• Money and funding
Legal and Regulatory Barriers	• Laws and policies
Organizational Barriers	• Hospital management
Technical Barriers	• Computers and IT
Professional Barriers	• Working at hospitals

Source: Khalifa, M. (2013)

This categorization provides structure to the process of examination and solution. Human barriers to implementation in the health sector were identified as the most prevalent. These, along with the discussions of professional barriers most notably involve academia. Members of the academic sector responsible for educating future healthcare professionals share much of the responsibility for this scenario. Guidance in the form of learning outcomes addressing HI knowledge and experience has been available for more than 20 years (IMIA, 2000). More recently, *The Topol Review* (Topol, 2019) reinforces the importance of educational support for both the current and future healthcare workforce. Integral to this is the need for collaboration between the health and academic sectors with the goal of creating a “culture of learning” (Topol, 2019, p. 16). Review of this literature would suggest human and professional barriers continue to threaten successful HI implementation in academia. The need to integrate HI theory as well as experiential learning are defined as essential to ensure provision of effectual formative education (Topol, 2019).

A search of literature focusing on the current status of HI curricula in various health science programs generated a variety of findings. Welcher et al. (2018) acknowledged many resources were available to guide the development of HI curricula (Welcher et al., 2018). In spite of this, the authors noted a gap persisted between industry’s needs and graduate HI knowledge and competency. Responsibility for this outcome was attributed to both the academic and health sectors. Academia lacked a complete understanding of the transformation currently underway in the health sector; healthcare, expecting graduates to have the ability to navigate HI applications immediately on hire, were seemingly unaware of the importance of providing student access to the EHR and other vital HI resources. This opportunity to train was noted as a key factor impeding the delivery of complete, current education. These findings suggest each of these industry partners had contributed to this deleterious outcome, due to ineffectual communication and assessment of need.

Hincapie, Cutler, and Fingado (2016) noted that while ample guidance was available from professional associations and regulatory bodies, limited literature could be found explicitly outlining the design of HI curricula that merged theory and training curriculum (Hincapie et al., 2016). The authors submit, in the absence of this basic framework, faculty does not have the data required to accurately inform teaching strategies. It was further noted that most faculty had not received HI theory and training during their formative education. It would seem feasible; therefore, the absence of these foundational elements would present as barriers to acceptance and use in academia.

This theme is corroborated by a study done to investigate academia's response to this evolutionary transformation in healthcare (Ashrafi, Kuilboer, Joshi, Ran, & Pande, 2014). These authors contend both the public and health sectors are aware of the need for HI education and training for healthcare professionals. The aim of their study was to determine whether the academic sector shared this awareness and if so, what was being done about it. The findings suggested academia must first improve its understanding of the salient HI requirements of each health profession in order to provide appropriate, relevant education.

Literature also claims a lack of understanding of HI purpose, functionality and usability has been identified as a key contributor to resistance in academia (Borycki, Joe, Armstrong, Bellwood, & Campbell, 2011). This, in combination with an allegedly poor understanding of industry needs, inconsistent availability of well-defined HI curricular guidelines and unsatisfactory experiential learning opportunities have reportedly impeded the integration of HI curricula.

Literature further suggests the interdisciplinary nature of HI has resulted in some distinct challenges. Determining ownership of and responsibility for HI in academia has proven to be problematic as the science is seen to overlap information systems (IS) and health sciences, thus blurring the lines of responsibility for curriculum development. Cervone (2016) submits HI belongs to neither discipline, but rather is a specialized entity comprised of components from both IS and health sciences (Cervone, 2016). The struggle to develop curriculum addressing industry need from each salient perspective could attribute to challenges experienced in the academic sector (Tilahun, Zeleke, Fritz, & Zegeye, 2014).

Curriculum development invokes rigorous attention to detail. Accordingly, the basic elements pertaining to HI must be defined and agreed upon by academia. In the absence of clearly delineated purpose, roles and responsibilities, the academic sector purportedly remains noncompliant in addressing stakeholder need. Hersh (2009) challenged those in the field of HI to initiate a debate addressing informatics definitions and terminology. This proposed research aims to understand perceptions and levels of knowledge of HI in a population with potentially wide-ranging degrees of experience. Therefore, a similar approach employing some precepts of the debate forum was introduced to encourage and sustain dialogue amongst the study population. This method of stimulating debate in focus groups served to foster interest in the topic, while providing an opportunity for those with some knowledge to inform members less cognizant of HI. This was particularly beneficial during the data collection cycle of this research. However, the potential to lead participant opinion and discussion was a concern. Accordingly, discussions required careful monitoring to minimize this impending bias.

Much has been written about the innovation of health informatics and its implementation in the health sector. Comparatively little literature, however, can be found that focuses on the nexus between this innovation and its integration into academia, particularly in the Middle Eastern region.

2.8.2 Enablers to Integration of HI Curricula

Research performed by Habboush, Hoyt, and Beidas (2018) examined the functionality of the EHR in practice in order to identify core competencies essential for future healthcare professionals (Habboush et al., 2018). The outcome of this study was the development of a framework, incorporating accreditation requirements and fundamental EHR functionality. The intended goal was to provide a structure for educators, informing curriculum development and implementation (Habboush, et al., 2018). This collaborative approach, involving the health and academic sectors, was notably a recurring theme in literature. Strategies involving team-based learning were included in recommendations made by research focused on identifying barriers to inclusion of HI in academia (Hincapie et al., 2016). This would align with the multi-faceted, interdisciplinary nature of health informatics.

The perception that use of this technology could negatively impact the patient-provider relationship was noted repeatedly in literature. Fears that HI would compromise patient-provider communication, professional autonomy and productivity have been cited as key concerns of healthcare professionals within the health sector (Barrett, 2018). As a result of this research, Barrett (2018) concluded, “One key to overcoming EHR resistance—regardless of where it originates—is communication” (p. 504). Lee, Alkureishi, Wroblewski, Farnan, and Arora (2017) concur with this statement, claiming communication skills involving this technology, the patient and the provider are rarely included in health science curricula (Lee et al., 2017). A means of improving this scenario, thus enabling effective, formative HI education and training, would be to incorporate “patient-centered EHR use” (Lee et al., 2017, p. 4) in curriculum. These authors noted a decided improvement in student comprehension, skills and ability to communicate with patients when provided with the opportunity to train using patient-centred EHR strategies. This recommendation requires student access to this technology, optimally in both the health and academic settings. This concept also reinforces the need for collaboration and team-based learning as discussed previously (Hincapie et al., 2016).

As noted, HI encompasses a broad spectrum of stakeholders. Developing curriculum to address the salient needs of each health science program and ultimately, each healthcare profession has been described as challenging. Shaanika and Iyamu (2019) recommend adopting a process-oriented approach to HI curricula design to facilitate effective, substantive education and training (Shaanika & Iyamu, 2019). By investigating the process of HI, educators gain contextualized perspective of the role played by each stakeholder and how this interacts and intersects with various programs within the field of health, IT, Business and more. This framework addresses the needs of both internal and external stakeholders, while adhering to academic governance and pedagogical requirements.

Curriculum development consists of a multi-phased approach. Literature suggests an efficient method of HI curriculum development should begin with the identification of champions in HI education and training (Parker et al., 2017). Modelling curricular design, which incorporates elements of proven best practice, is seen as instrumental in enabling successful, sustainable integration of HI curricula. Parker et al. (2017) note adaptation of the adopted framework is essential, to ensure academia is addressing the distinctive needs of their partners in industry. This model of curriculum development incorporates research, development and dissemination with the added goal of maintaining pace with rapid technological advancements in healthcare (Parker et al., 2017).

In conclusion, some stakeholders may view the introduction and assimilation of HI in academia as an emerging niche. Literature provides many definitions of the niche perspective including that by Sharpe, Hodgson, Leicester, Lyon, and Fazey (2016) who describe this concept as “pockets of the future in the present” (Sharpe et al., 2016, p. 7). Literature reviewed for this study would concur with the essence of this definition as, even though HI has been present for decades, as noted earlier, this science continues to be perceived as a recent innovation in healthcare. The continuous evolution of HI may be one explanation for this perception. Geels, Tyfield, and Urry (2014) provide another pertinent definition, describing emerging niches as episodes of “radical innovation” (Geels et al., 2014, p. 23). This concept also applies to HI functionality, as claims in literature suggest it is responsible for the transformation of healthcare (Harris & Lazuta, 2017). As such, literature advises emerging niches must be viewed as complex collections of knowledge and skills (Metelerkamp, Biggs, & Drimie, 2020). This concept aligns well with the varied and salient requirements of all schools of health within the academic sector. Those responsible for HI curriculum design must be cognizant of the intra- and interdisciplinary roles and responsibilities of each health profession. Viewing the prospect of curriculum development from this perspective is felt to facilitate the sustainable, autonomous conceptualization of each profession (Metelerkamp et al., 2020).

2.9 How is health informatics currently integrated into curricula for the education and training of healthcare professionals?

Provision of informatics competencies requires curriculum that includes theory supported by experiential learning. Curriculum development must incorporate the salient needs of a diverse group of health professions, each with their own specific list of requirements and preferences. Hersh (2009) recommends collaboration between the academic and health sectors is required to support teaching and learning. Exploring the method in which future health professionals are prepared for the evolution in HI is the primary goal of this project. Understanding the theory and practice of curriculum development are essential components and completes the framework of this review.

2.9.1 Health Informatics Curricula

Academia's perception and understanding of HI influences the manner in which its responsibility is met. As mentioned previously, HI applications have been in existence for more than 65 years. In spite of this, academics continue to report HI is poorly understood both in academia and in healthcare (Kushniruk, Lau, Borycki, & Pratti, 2006). Perhaps the inability to define and identify the purpose of HI, specifically the EMR/EHR, has contributed to this situation.

This concept was the focus of research performed by academics from eight universities across Canada. The collaborative aim was to assess the needs of both academic and health sectors with regards to HI and accordingly develop national informatics curricula (Kushniruk et al., 2006). In response to the need for trained health informaticians, as well as the need to provide relevant education and training to all health professions, the authors developed an integrated model for HI education and research. The on-going need to educate and train healthcare professionals in the theory and application of this elemental resource was emphasized. This model is of significant relevance to this research as it provides a basic framework for curriculum design.

Shaanika and Iyamu (2019) discuss three key factors that influence and motivate HI curriculum development (Shaanika & Iyamu, 2019). These factors are: rigor, relevance and context. The field of HI overlaps multiple disciplines, extending beyond health sciences to include information technology, information governance and more. It is conceivable strategies to achieve and ensure rigor in curriculum development across disciplines may become complex. This same concept could compromise relevance and context of curriculum. Maintaining balance between IT and health science content, while addressing these three key factors may be perceived as challenging.

Sitlington and Coetzer (2015) submit application of the Delphi technique has the potential to develop curriculum, which incorporates content deemed essential by multiple disciplines (Sitlington & Coetzer, 2015). The Delphi technique incorporates surveys and opportunities to share dialogue, enabling a diverse group of professionals to reach consensus. Applying this process would ensure all disciplines involved in the use of this technology in healthcare would have equal opportunity to contribute to HI curriculum development. Assessing stakeholder need is a process also addressed in Kern’s six-step approach to curriculum development (Kern, Bass, Thomas, & Howard, 1998). This methodology is discussed in detail in the following section.

2.9.2 Curriculum Development – Applying Kern’s Model

The model developed by Kushniruk et al. (2006) aligns with Kern’s approach to curriculum development, which begins with general, then targeted needs assessment (Thomas, Kern, Hughes, & Chen, 2016). Literature suggests this fundamental phase, inherent in any systems design, has often been omitted from discussions involving informatics (Luna, Almerares, Mayan, De Quiros, & Otero, 2014). Medical educators at Johns Hopkins University created a six-step approach to curriculum development, ensuring relevance, currency and alignment with change (Kern et al., 1998). Kern et al. (1998) recognized academia's responsibility to develop curriculum is often attempted in the absence of requisite training, experience or resources. The authors admit to "the impossibility of imparting a complete knowledge base" (Kern et al., 1998, p. 2) and rather recommend graduate competencies include effective, efficient access to "an ever-evolving medical knowledge base" (p. 2). This is a dynamic, iterative and on-going process driven by evaluation of student success and the corresponding evolution of the teaching and learning environment. The authors describe this as "a practical, theoretically sound approach to developing, implementing, evaluating and continually improving education experiences in medicine" (Kern et al., 1998, p. 1).

Table 4. Six-Step Approach to Curriculum Development

Step	Action
1	Problem identification and General Needs Assessment
2	Needs Assessment of Targeted Learners
3	Goals and Objectives
4	Educational Strategies
5	Implementation
6	Evaluation and Feedback

Source: Curriculum Development for Medical Education: A Six Step Approach (Kern et al., 1998).

Developed in 1998, Kern et al.'s model for curriculum development continues to be viewed as relevant and applicable to the current academic setting. Recent literature describes application of the original six-step approach, leveraging this concept to the online environment, which is escalating within the health sector (Chen et al., 2019). Kern's model is significant to this research. The need to appraise faculty knowledge, competencies and abilities to develop relevant curriculum is a primary goal of this research. The "Six-Step

Approach to Curriculum Development" (see Table 4) provides a valuable framework, facilitating discussion and assessment of curriculum development in this research setting.

Applying Kern et al.'s (1998) framework begins, as noted, with problem identification. Literature has provided numerous and detailed descriptions of this problem. Health professionals require education and training in informatics applications, in this case, the EMR. The next step focuses on assessment of need. Prior to that, academia must have contextualized understanding of stakeholder roles and responsibilities. Only then can academia comprehend need and subsequently plan, develop and deliver curriculum to address these needs. Academia's perception and knowledge of HI and its application in healthcare will surely influence curriculum development. Lacking this awareness remains problematic and continues to contribute to the alleged inadequate state of informatics curriculum.

Careful attention to the learning needs and styles is essential in assessment of need. This includes an awareness of the consumer (the student) and their learning environment. Thomas et al. (2016) contend this effectively facilitates the development and integration of curriculum (Thomas et al., 2016).

2.9.3 Complexity of Curriculum Design in Health Sciences

Curriculum development in all schools of health is complex. Constant advances in medical knowledge and the dynamic nature of the modern healthcare delivery system all contribute to this complexity. Another factor, as noted previously, is the varied knowledge, skills and practices embedded in each health profession. Adding to this is the intricate and collaborative nature within which this diverse group of health professionals exist and work. Academia has the responsibility of developing and delivering curriculum that properly equips all graduates. Bois et al. (2016) suggest academia must recognize the diverse learning styles and needs of the adult learner, recommending integration of the tenets of andragogy when designing medical curriculum (Bois et al., 2016). The assumptions comprising this adult learning theory support contemporary development of curriculum. Innovation in curriculum development, while described by many as the optimal goal, is hindered in practice. Integration of technology in both academia and healthcare were perceived as opportunities, thus enablers, for improvement rather than challenges or barriers. Bois et al. (2016) accordingly incorporated cognitive multimedia learning theory to develop curriculum. This permitted mindfulness of learning needs as well as of graduate competencies.

David Kaufman (2003) submits andragogy is a framework providing guidelines rather than theory pertaining to the adult learning environment (Kaufman, 2003). Kaufman (2003) cites principles focused on 'independent' and 'self-directed' learning are of key importance in equipping adult learners with requisite knowledge and skills. Other principles of andragogy that serve to involve, encourage, support and motivate adult learners are also described as fundamental requirements. Kaufman (2003) suggests a constructivist theory whereby teachers 'facilitate' rather than 'transmit' knowledge has key significance in the current teaching and learning environment. This theory concurs with the principles of andragogy, suggesting active engagement of the learners is critical and therefore essential in curriculum development.

2.9.4 Learning Theory

Literature on learning theory, specifically in reference to medical education, describes the current challenge is to maintain flexibility, evolving to keep pace with the rapid accumulation of medical knowledge (Blumenthal, Mays, Weinfeld, Banks, & Shaffer, 2008). Incorporating Kern et al.'s (1998) methodology for curriculum development would support this assertion. Routine review of curriculum, beginning with general and targeted needs assessment has the potential of providing valuable direction and guidance.

A further example of this is found in research performed by Sweet and Palazzi (2015) in which Kern et al.'s (1998) model is applied in developing curriculum for global health residents in a medical college in the US (Sweet & Palazzi, 2015). The students were to design patient education materials with attention to both domestic and international context. Workshops guided participants through the framework established by Kern et al. Research findings concluded Kern et al.'s six-step approach facilitated detailed reflection of the needs of targeted learners and ensured the key goals of educators and learners were in close alignment. Developing curriculum mindful of regional and global culture was pertinent to this research. Educators represented a diverse collection of international expertise; students represented a group with specific regional, cultural needs and expectations.

Goldie (2016) submits tenets found in connectivism may facilitate educators in their approach to teaching and learning (Goldie, 2016). While this article describes application of this theory in the context of e-learning environments many points are applicable to this discussion of incorporating information and communication technology curriculum in health science programs. This theoretical framework perceives learning as a network. Acquisition of knowledge and skills are the result of collaboration between these networks of students. This approach aligns well with the autonomous, yet inter-connected relationship between healthcare professionals. Designing and delivering curriculum which complements the conceptual framework of connectivism would address both the diverse, yet specialized areas embedded within and throughout these professions. Goldie further suggests the act of decision-making is a learning process involving a collection of stakeholders (Goldie, 2016, p. 1065). The concept of collaborative decision-making, while commonplace in the health sector, may not be as well represented within and between schools of health. Merging this theory with Kern et al.'s (1998) six-step approach would equip educators with strategies to develop curriculum, which meets the needs of diverse, targeted and potentially integrated groups of learners.

2.9.5 Experiential Learning

Literature suggests HI applications have been adopted in varying degrees and with varying success throughout the health care industry. As discussed earlier, one factor contributing to this scenario is the lack of trained health care faculty. Smith and Agresta (2010) suggest this may be attributed to the exclusion of academia from any strategic and operational planning held prior to and throughout the design, implementation and evaluation phases (Smith & Agresta, 2010). The authors submit academia endeavours to maintain pace with industry as Health Science divisions expand to include biomedical and informatics programs. However, it is their contention these programs are designed by "those with business, political, or advocacy interests" (Smith & Agresta, 2010, p. 1108) and recommend that representation from health science divisions within academia is essential. Basic terminologies used by those planning, teaching and using 'health informatics' does not align; this was seen as significantly contributing to the lack of trained faculty and ultimately, the lack of well-equipped graduates (Smith & Agresta, 2010).

Academia, recognised as a key stakeholder of informatics, is further divided into three sub-groups: student, faculty and academic management. Research involving senior academic management and faculty at medical schools in the United Kingdom assessed the current status of informatics tuition (Walpole, Tayor, & Banerjee, 2017). The findings indicated medical education was not providing graduates with the requisite knowledge and competencies pertaining to HI. These findings provide valuable insight and context. It might be concluded from this assessment that academic leadership is also experiencing difficulty in keeping pace with the evolution of HI.

Access to resources supporting experiential learning has been identified as problematic. The confidential nature of the information held within the EMR/EHR contributes to this outcome. Gaining permission for students to train on an EMR in the health sector is not easily accomplished. Research performed in the UK supports this contention. A sample of students from every medical school in the UK was surveyed. Seventy per cent of respondents claimed, “There was little or no HI training” (Walpole et al., 2017, p. 1) and that while theory was offered, it was in varying amounts and formats. Students and graduates noted a lack of confidence in using HI in their clinical practice. Recommendations for standardized national guidelines pertaining to curriculum were made. These questions and findings align with the aim of this research and were useful in guiding the development of questions for use in focus groups. This research would also suggest application of Kern et al.’s (1998) approach to curriculum development would have obviated this negative feedback.

2.9.6 Examples of Informatics Education and Training

A study performed in the United States investigated the prospect of including electronic health records as part of the tuition in schools of medicine (Graham-Jones et al., 2012). The research used a quantitative survey to collect data from its study population. An interesting aspect of this methodology, however, was that a faculty representative of each health science program was invited to write questions for possible inclusion in the survey. Other members of the faculty then validated these questions. Applying this process to this research, participants were invited to submit questions for discussion during focus groups. Such practice ensured areas of interest were addressed and facilitated engagement of the participants.

A collaborative effort to develop and deliver HI tuition involving universities across Canada has been described by Kushniruk et al.

(Kushniruk et al., 2006). Their discussion of the collective design of curriculum pertains to working health professionals wishing to improve their knowledge and skills in HI. Various divisions within the Schools of Health developed learning modules for use by any healthcare professional wishing to upgrade to a master's level in HI. A shared curriculum was designed for use, acknowledging that all healthcare professionals have a common area of interest in HI. This aspect of collaboration between programs is relevant to the proposed research; participants were asked to discuss the possibility of employing a similar framework at HCT involving all health science programs. As discussed previously, participants were asked to submit questions and discussion items pertaining to their area of expertise, allowing them the opportunity to envisage how this development may impact their form of teaching and learning.

The Curriculum Task Force of the International Society of Computational Biology (ISCB's) Education Committee investigated the current and future curricular requirements of those responsible for educating informaticians (Welch et al., 2014). While this review focused on a specific group within the health science academic sector, the authors recognized the interdisciplinary nature of HI and the need to establish sets of core competencies for an ever-increasing scope of educators and students. Three categories of informatics "personas" were established to facilitate an understanding of roles, responsibilities, thus educational requirements. These categories included bioinformatics users, scientists and engineers (Welch et al., 2014, p. 5). As a result of this process, the authors were able to produce a listing of core competencies for each category. In 2016, this same task force reported on the follow-up evaluation of these core competencies, identifying the need to broaden the scope of the competency profiles (Welch et al., 2016). The authors noted a sense of confusion existed amongst educators, uncertain how to address the teaching and learning needs of such a diverse group. Accordingly, consultations with numerous healthcare professions were done to determine required knowledge and competencies. Subsequently, recommendations to establish curricular guidelines and core competencies for multiple, distinct professions were made. This general and targeted needs assessment aligns with Kern et al.'s (1998) model of curriculum development. The act of first establishing consensus regarding an essential competency profile for each health profession enabled the development of a curricular guideline framework.

2.10 Comparative Adoption of Information Technology in other Sectors

Information technology (IT) and information communication technology (ICT) have changed the way most sectors conduct business. The key impetus behind this is the rapid and continuous advancement of information technologies. Complementing this is the Internet, which enables simplified, seamless access to data. This presents as both substantial opportunities to key stakeholders as well as significant, almost prohibitive threats to its use. A comparison literature addressing the adoption of technology in the commercial, health and academic sectors are discussed in the following section.

2.10.1 Adoption of Information Technology in the Commercial Sector

Literature contains extensive evidence of the increasing use of information and communication technology (ICT) in the commercial sector. Rigby and Ammenwerth (2016) assert this rapid adoption may be attributed to that sector's capacity to adapt, transforming fundamental processes to incorporate applications of ICT (Rigby & Ammenwerth, 2016). These authors note that while the 'service' or outcome has not changed, the processes involved have been restructured.

This new model of commerce has evolved in concert with societal behaviour and expectations. Many studies have been done to determine which came first, the innovation or society’s expectation/demand for increased efficacy and simplification of processes. Marshall McCluhan examined this scenario in 1964 when he wrote, *“The Medium is the Message”*, wherein he suggests the outcome is inconsequential (McCluhan, 1964). Rather, it is the process, altered by the medium (in this case, ICT) that is now perceived as “staples or natural resources” (McCluhan, 1964, p. 10). In this instance, technology is perceived as an extension of oneself, and of the personal (individual) and collective (societal) environment in which we live and thrive. One has only to look to members of the Generation Z population, born from 1993 to 2005, as an example of this. This group, also referred to as ‘digital natives’, was born after the introduction of the Internet; the expectation to interact, communicate and connect with the world using technology is innate (Turner, 2015). Accordingly, this generation is being defined by the introduction of this “related phenomena” (Turner, 2015, p. 103).

Oliveira and Martins (2010) studied the adoption of technology in the commerce sector using the TOE framework (Oliveira & Martins, 2010). This model focuses on three concepts; *technology* readiness and integration, *organizational* structure and processes, and *environment*, specifically availability of the Internet and the competitive factor. Their findings suggest organizations claiming technology “readiness” and “integration” reported the greatest rate of adoption (Oliveira & Martins, 2010, p. 53). Baker, in his research of applications of the TOE framework, found that technology used to enhance and improve current processes was adopted more readily than technological innovations that incorporated completely new processes (Baker, 2011). In both instances, this outcome was attributed to lower levels of risk and the anticipated need to change.

Research by Schmidthuber, Maresch, and Ginner (2018) investigated the adoption of technology, specifically the use of mobile payment in Austria (Schmidthuber et al., 2018). These authors similarly found the perception and anticipation of risk diminished adoption of this technology. However, in contrast to findings by Oliveira and Martins (2010), these authors noted Internet penetration and usability, tenets of the TOE framework, had no significant impact on the adoption of this technology (Schmidthuber et al., 2018, p. 8). These findings suggest an individual’s perception of risk represents a key barrier to acceptance of technology within the commerce sector. Another interesting aspect of this study was the delineation of mobile payment as a disruptive, rather than incumbent (current, pre-existing), technology (Schmidthuber et al., 2018, p. 2). Disruptive technologies provide a new process by which the desired service or outcome is achieved. As such, disruptive technologies encounter no previously established competition (Bower & Christensen, 1995). Findings of the study performed by Schmidthuber et al. (2018) reveal adoption of disruptive technology increases with one’s perception of usefulness. This is in contrast to conclusions discussed by Baker (2011) and Oliveira and Martins (2010) wherein technologies involving completely new processes are not readily adopted by end-users. The theme shared by all three studies is the negative impact of perceived risk on the adoption of technology in the commercial sector.

Cost of technology was often found to impede end-user adoption (Koenig-Lewis, Marquet, Palmer, & Zhao, 2015). Schmidthuber et al. (2018) reported concerns relating to the cost of technology in the commercial sector were so significant, as to negate any perceived impetus relating to ease of use (Schmidthuber et al., 2018, p. 8).

Recent literature describes three common factors influencing the adoption of technology: product features, ease of use and safety (Tarabasz & Poddar, 2019). These findings are corroborated by a systematic review of literature aimed at identifying and consolidating factors influencing adoption (Chhonker, Verma, Kar, & Grover, 2018). In addition to risk management, ease of use and usefulness, the attitude of the end-user was noted as significantly influencing adoption (Chhonker et al., 2018, p. 221). As each generation, from baby-boomers to Gen Z, gain awareness of and experience with this technology and its personal return on investment, acceptance increases (Vogels, 2019). Perhaps, as suggested by Marshall McLuhan, this medium has generated a change in societal expectations, thus defining the service features and the consumer behaviour (Rigby & Ammenwerth, 2016, p. 4).

Literature contends information technology has had a profound influence on market and business models within the commerce sector (Lamboglia, Cardoni, Dameri, & Mancini, 2018). The ability to network at the individual and organizational levels is offered as an explanation for this evolutionary change in commerce. The negative impact of disruptive technology, which introduces completely new processes to achieve an outcome, is countered by the ability to network with individuals and organizations sharing the same purpose and function. This concept closely resembles the goal of ICT applications in the health sector, to share information vital to judicious and efficient decision-making. This is discussed in detail in the following section. Creating an open, collaborative environment enabled by technology is seen as crucial to the success of current and future market and business models (Lamboglia et al., 2018, p. 14).

2.10.2 Adoption of Information Technology in the Health Sector

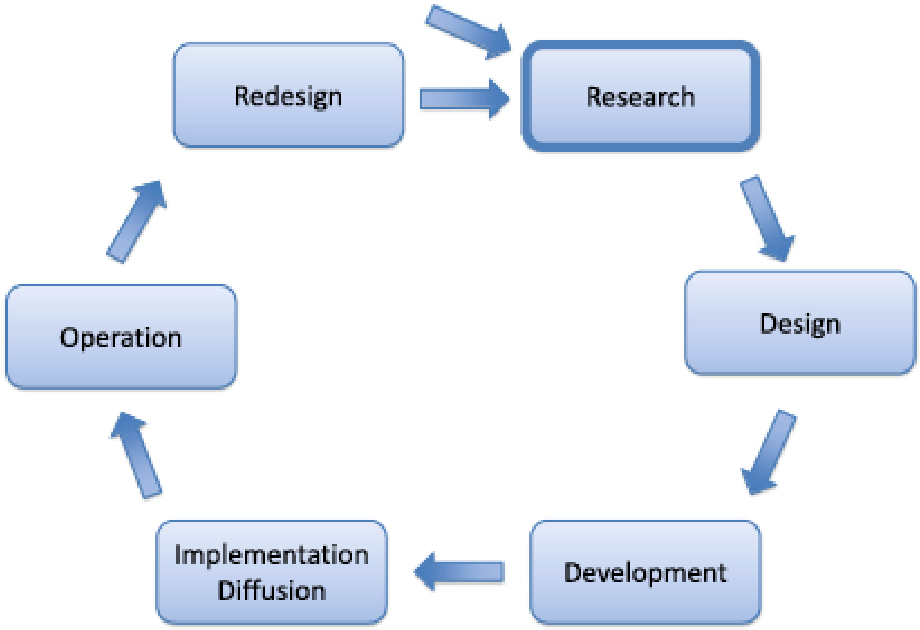
Numerous applications of technology have been adopted throughout the health sector, especially in diagnostic and therapeutic services. However, the focus of this literature review is the adoption of information and communication technology in the healthcare environment. Specific focus is on the EHR as this is most pertinent to the aims of this research.

Factors influencing the adoption of IT in the health sector have been the topic of research since its inception in the early 1970s. Literature contends the speed at which consumers adopt technology within the commercial sector continues to outpace acceptance in the health sector (Rigby & Ammenwerth, 2016, p. 4). These authors suggest this hesitance is due to healthcare's aversion to alter traditional processes. This concept provides further evidence that adoption of incumbent technologies exceeds that of disruptive technologies as noted in research within the commercial sector (Baker, 2011; Oliveira & Martins, 2010). Rigby and Ammenwerth (2016) assert resistance to use is due, in large part, to the lack of evidence proving efficiencies. A similar point was raised in research performed by Eide and Johnson (2014), suggesting iterative review and evaluation by end-users has been omitted from the implementation process, thus impeding end-user acceptance (Eide & Johnson, 2014). Research by Høstgaard, Bertelsen, and Nøhr (2017) reported similar findings, attributing this outcome to issues relating to organizational structure (Høstgaard et al., 2017). These authors suggest the exclusion of end-users in strategic and operational planning poses a key barrier to acceptance (Høstgaard 2017, p. 2). Technology literacy, attitude and competency, attributes previously considered to be key barriers were no longer acknowledged as the primary reasons for resistance to acceptance. However, the need to adapt the organizational framework to accommodate and support this innovation, thus ensuring fundamental, collaborative strategic planning, had not been addressed (Høstgaard et al., 2017, p. 3). The focus on inclusion and collaboration is central to end-user acceptance, all with the intended goal of achieving and maintaining balance between the technical and human factors. Mumford introduced this concept in 1993, suggesting organizational structures must adapt to facilitate key stakeholder involvement in systems design and analysis (Leitch & Warren, 2010). Review of literature suggests this recommendation is yet to be adopted within the health sector.

Doctor Wachter and his advisory group identified similar issues inhibiting the adoption of technology within the UK health sector

(Wachter, 2016). Plans to establish a strategy for digitisation should ideally include stakeholders at the local and regional levels. Strategies to implement technology that would alter, enhance or introduce new processes within each sector of healthcare would succeed only with continual, long-term engagement of the end-users (Wachter, 2016, p. 5). Continuing and expanding upon this review in 2019, Doctor E. Topol led an advisory group assembled to review current and future readiness to digitise healthcare in the UK (Topol, 2019). This group of experts made similar recommendations, emphasizing the essential and prudent need to include end-users, including the patient, in the design and analysis phases of this systems development lifecycle (Topol, 2019, p. 10). The shift to a wellness model of health (in contrast to the former model focusing on illness) supports inclusion and empowerment of the patient. Another key principle discussed in this review is the need to support both the current and future healthcare workforce, providing this extended group of end-users with the opportunity to evaluate this new technology (Topol, 2019, p. 10). This concept of inclusion is a basic premise of the information system development life cycle (SDLC), which begins with stakeholder’s needs assessment, continuing with iterative evaluation and feedback throughout the design and implementation phases until the system is operationalized (see Figure 2; Høstgaard et al., 2017, p. 3). Reviews by Wachter and Topol draw attention to this fact and its relevance to the successful digitisation of healthcare. Applying SDLC methodology to HI has been often been recommended in literature pertaining to HI design and implementation (Borycki, Househ, et al., 2011). Current literature continues to include this as a recommended path to improved acceptance, suggesting this foundational framework continues to go unnoticed.

Figure 2: Information Systems Development Life Cycle



Source: Constructive eHealth evaluation: Lessons from evaluation of EHR development in 4 Danish hospitals (Høstgaard et al., 2017).

A systematic review of literature by Evans (2016) found that while some progress had been made, realisation of anticipated goals and ultimate acceptance of technology in the health sector have not yet been met (Evans, 2016). Literature acknowledges advances in clinical decision support (CDS), health information exchanges (HIE) and implementation of international IT standards and yet continues to claim more education and training are needed (Evans, 2016, p. S53). The practice of maintaining hybrid patient records is given as an example of the sustained hesitation to completely adopt this technology. This tendency would support claims made throughout literature that healthcare professionals continue to favour traditional practices over new, disruptive technologies, at least until some evidence of return on their investment is realised (Sheikh et al., 2011, p. 7).

Innovations in HI continue to occupy strategic and operational planning in the health sector. Literature suggests some evidence exists confirming EMR adoption rates have reportedly increased. This trend has been supported, in some instances, by government initiatives such as the Health Information Technology for Economic and Clinical Health (HITECH) Act and Canada Health Infoway (Gibson, Dixon, & Abrams, 2015). In each instance, monetary incentives have been used to initiate adoption of the EMR. Literature suggests limited evidence exists to confirm if the predicted return on investment has been realised by the health sector (Goldzweig, Towfigh, Maglione, & Shekelle, 2009). A factor complicating this analysis has been a noted lack of useful cost-benefit data to support this claim, thus making analysis difficult. Goldzweig et al. (2009) recommend governance and policy is required to support the collaboration of successful informatics applications with the appropriate industry partners. This hypothesis aligns with that of Rigby and Ammenwerth (2016) who, as noted above, attribute end-user resistance to acceptance is due to a lack of clarity and transparency in strategic investment (Rigby & Ammenwerth, 2016, p. 4). Advances in health care are often based on shared best practice; transformation of health care policy and procedure, supported by HI should be no different.

McLachlan et al. (2019) apply the “ITPOSMO framework” to investigate barriers to and enablers of EHR adoption and embedded learning health systems (LHS; McLachlan et al., 2019). This framework is an acronym for the key elements forming the foundation for inspection and evaluation of information systems design and implementation. These elements include information, technology, processes, objectives, staffing, management and other factors. The focus of their research was LHS; however, the same barriers and facilitators are relevant to EHR adoption due to the interrelated nature of these two systems. The authors attribute the sluggish adoption of EHRs to the poor understanding of and inability to manage this “digital disruption” (McLachlan et al., 2019, p. 8). This outcome was leveraged upon multiple aspects of the health sector including disruption to workflows, increased staff anxiety and concerns pertaining to quality and risk, all purportedly the result of excluding key stakeholders from the design, implementation and evaluation phases of this IT project. At the other end of this spectrum, facilitators contributing to successful adoption of EHRs emphasise the importance of patience and the need for a staged implementation (McLachlan et al., 2019 p. 6). This aligns with recommendations made by Wachter (2016) who cautioned against the urge to digitise healthcare too quickly (p. 29).

Adoption of technology in the health sector, specifically the EHR, continues to be the subject of much scrutiny and discussion. This literature review would suggest that despite having been introduced decades ago, work remains to ensure committed and sustained adoption is achieved. Organizations have been cautioned to “focus on what matters to people”, creating an organizational culture founded on collaboration and inclusivity (Topol, 2019, p. 68). Literature advises the health sector to align the introduction of this disruptive technology with each phase of the SDLC, thereby contributing to an open and inclusive culture, ready and able to adapt to and adopt innovations.

The commercial sector spends much time and effort ensuring customer needs are met, out of obvious necessity to secure return on investment. Innovations in technology continue to be trialled and implemented in the hopes of reaching and appealing to a broader group of consumers (Schmidthuber et al., 2018). Review of literature focusing on similar practices in the health sector describes an increasing awareness of this concept but conclude this remains an unmet goal. Elton and O’Riordan (2016) write about the urgent need to evaluate and modernize business models within the health sector, shifting the focus from input- to output-based reimbursement strategies (Elton & O’Riordan, 2016). This transformation utilises data stored within the EHR and other integrated information systems to determine reimbursement based on achieved optimal health outcomes rather than units of care or service provided (Elton & O'Riordan, 2016). This strategy to incentivize healthcare not only demands a shift in focus to *health* rather than *disease*, but also places the primary consumer, *the patient*, at the centre of attention. An example of this disruptive practice in healthcare is the tailored preparation and delivery of medication, specifically designed to meet the patient's needs. This process would establish an "Uber" approach to the pharmaceutical practices. The inherent impact on competitive market share, disruption of organizational structures and cultures, and economics of health are almost incidental to the potential improvements to patient outcomes. These associated incidentals include improved patient compliance, reduction in medication errors, and improved utilization of human and physical resources (Elton & O'Riordan, 2016). Technology required to support these applications might sound futuristic, but is, in fact, currently available and remains to be fully utilized.

It is conceivable, as suggested by Rigby and Ammenwerth (2016), that the health sector's preference to continue with traditional practices has delayed adoption of technology. However, the potential innovations in healthcare discussed by Elton and O'Riordan (2016) may pique the interest of many stakeholders of health, resulting in increased and expanded adoption.

2.10.3 Adoption of Information Technology in the Academic Sector

Literature records the introduction of technology in the academic sector beginning in the mid 1970s (Paddick, 2016). It is important to note the distinction between technology in education and educational technology as numerous forms of each have been utilised throughout academia. This literature review focuses on the adoption of information technology in the academic sector. Hooper and Rieber (1995) emphasised this difference in their discussion of the adoption of technology into the process of education (Hooper & Rieber, 1995). In 1995, these authors predicted the successful application of educational technology would transform academia by creating a more student-centric learning environment (Hooper & Rieber, 1995, p. 4). They also advised educators to be willing to adapt to these changes, concluding, “there will never be a final solution” (Hooper & Rieber, 1995). While this was written more than 20 years ago, their counsel remains relevant today.

Adoption of technology in academia has continued to be the focus of much research since this statement was made. Understanding the acceptance of this innovation from the perspective of educators has been the primary aim of these investigations. Scherer, Siddiq, and Tondeur (2018) examined teacher acceptance of technology, noting successful adoption and implementation remains problematic (Scherer et al., 2018). This scenario is attributed to two constructs, each having the potential to impede adoption. The first relates to the teaching and learning environment wherein educators work constantly to balance the need to ensure continuity with the desire to be innovative and creative in their delivery and assessment of curricular content. The second is the rapid evolution of technology with its implicit message of the need to change. Continuing with this theme, a study performed in the Middle East found the greatest cause of anxiety was related to the inability to maintain pace with technological advances (Abu Karsh, 2018). Interestingly, the concept of integrating technology into teaching practices caused the least amount of anxiety amongst educators. Comprehensive training, supporting educators as they determine how best to integrate this resource in their teaching was identified as essential to mitigating technology anxiety (Abu Karsh, 2018, p. 24). Mirriahi, Dawson, and Hoven (2012) expand on this theory, noting acceptance and adoption increase when educators are given the opportunity to share insights about successful applications of technology with their peers (Mirriahi et al., 2012). It is possible that discussions led by early adopters of educational technology could potentially address most if not all of these barriers to acceptance.

Several models have been developed to facilitate an understanding of this scenario, all with the goal of enhancing pre- and in-service educators' competence with and acceptance of technology. The focus of core curriculum in teacher education, for pre-service educators, has evolved from a focus on content knowledge (CK) and pedagogical knowledge (PK) to the current need to include technological knowledge (TK). This describes the structural framework referred to as TPACK (technological, pedagogical and content knowledge), which incorporates each knowledge domain to ensure teacher preparedness (Mishra & Koehler, 2006). Mishra and Koehler (2006) submit technological advances in education impact both content and pedagogy, thus necessitating inclusion of the third knowledge domain, technology (Mishra & Koehler, 2006, p. 1018). These authors submit it is not enough to introduce technology to teachers, but to determine the technological needs of educators and how this resource can be used to enhance and incorporate content and pedagogical knowledge (Mishra & Koehler, 2006, p. 1020). Lee and Tsai (2010) continue with the premise of exploring teachers' needs, expanding the TPACK model to include knowledge of Web pedagogy, thus introducing TPACK-W (Lee & Tsai, 2010). This research investigated educators' self-assessment of their comprehension of and competence with incorporating Web pedagogy with current teaching practices. Findings suggested the older, more experienced educators were less aware of this concept or of its importance to the learning environment (Lee & Tsai, 2010, p. 17). It is conceivable, as noted with stakeholders in the commerce and health sectors, that some academics prefer traditional practices and chose to resist use of this disruptive technology.

Research by Pierson and Borthwick (2010) supports the importance of assessing teachers' needs pertaining to the meaningful use of technology to enhance teaching and learning (Pierson & Borthwick, 2010). Tenets from the TPACK model were incorporated to evaluate what educators deemed essential for them to achieve effective technology-integrated teaching (Pierson & Borthwick, 2010, p. 127). Including teachers in strategic planning to assess need, design, deliver and evaluate technology integration were key recommendations (Pierson & Borthwick, 2010, p. 126). These closely align with phases of the systems development life cycle (SDLC) and echo suggestions discussed previously regarding technology adoption within the commerce and health sectors. It is conceivable the introduction of technology-integrated teaching may be viewed as a system, *disrupting* traditional beliefs, comprehension and competencies, thus invoking the propensity to resist adoption.

Literature describes the perception, or reality, of a digital divide as a key element, hindering acceptance of technology in academia. Faculty perceive students, described as digital natives, as having superior technological knowledge and skills, resulting in educators' hesitancy to adopt this resource (Teo, 2014). Neumann (2016) cautions educators to consider learning styles and preferences of this technology-savvy generation (Neumann, 2016). This generations' predilection to obtain information instantly does not equate to an instant acquisition of knowledge. Navigating and managing difficulties with information literacy, unrealistic expectations for immediate feedback and plagiarism are some of the challenges facing educators (Neumann, 2016, p. 105). Nagel (2016) contends digital literacy challenges all age groups, suggesting neither the young nor the old are proficient at using it effectually (Nagel, 2016).

As noted previously, technology has been available to the academic sector for several decades and yet adoption continues to be defined as problematic. This literature review has discussed diverging opinions regarding the impact of age on adoption rates as well as general agreement concerning the on-going need for training and practical application. Rather than merely introducing the basic offerings of technology to educators, literature suggests a transformation is needed to ensure governance, leadership and experiential opportunities align with the current and future needs of both academics and students (Nagel, 2016, p. 30).

2.11 International Variance in HI Implementation and Education in Various Health Systems

Literature has described the potential for EHRs to leverage multiple improvements upon health outcomes, healthcare management, research and more. Digitising health care and service has been the goal of health sectors around the world since the inception of this resource. As discussed previously in this chapter, HI technology has been available for several decades. However, reports of successful implementation and adoption remain somewhat elusive, this varying on a global scale. Adapting IT to align with each nation's specific healthcare system, complying with universal and regional standards while being cognizant of sociocultural nuances are potential challenges contributing to this scenario. The following is a discussion of literature addressing this variance in HI implementation with reference to integral requisite education and training, diversity of healthcare systems and selected implementation methodologies.

Fried and Gaydos (2002) describe three categories of healthcare systems worldwide: publicly funded systems, private-funded systems and completely private systems (Fried & Gaydos, 2002). Publicly funded systems suggest universally accessible healthcare funded through taxation. Private-funded healthcare systems combine some portion of consumer contribution with a portion of government refund. Private healthcare systems are either funded completely by the consumer, or by personal and/or employer-provided health insurance.

Recent research examining EHR implementation in Europe, North America, Middle East and Asia found successful EHR implementation is still not progressing as expected (Fragidis & Chatzoglou, 2018). Factors contributing to this unsatisfactory outcome align with barriers discussed earlier, primarily citing end users' preference to continue with traditional processes. Transparency of government and health sector agendas, and enlistment of stakeholder commitment and involvement were generally acknowledged as critical success factors (Fragidis & Chatzoglou, 2018, p. 123). However, it is their comparison of implementation processes with each participating nation's salient health system that is of specific interest and relevance to this research (*see* Table 5). The classification of IT implementation methods proposed by Coiera (2009) provides important context when examining EHR adoption at an international level (Coiera, 2009). Decisions to implement national HIT systems are defined according to one of three approaches: top-down, bottom-up, or middle-out. A government-driven national approach to EHR implementation, such as that initially adopted in the UK is an example of top-down system design (Eason, Dent, Waterson, Tutt, & Thornett, 2012). Conversely, implementation of this technology focused at the local level, such as in the US, represents a bottom-up approach (Adler-Milstein et al., 2015). EHR system implementation defined as middle-out relies on the federal government for support and funding, with input from the constituent level (provincial, territorial, regional). Canada and Israel have employed this implementation methodology (Fragidis & Chatzoglou, 2018, p. 121).

Table 5: Healthcare Systems and EHR Implementation Approach

	UK	CA	US	IL
National healthcare systems				
Publicly funded	✓	✓		
Private funded			✓	✓
Totally private				
EHR implementation approach – method used				
Top-down	✓			
Bottom-up			✓	
Middle-out		✓		✓

Source: Adapted from Fragidis and Chatzoglou (2018)

2.11.1 HI Implementation and Education in the UK

The National Health Service (NHS) of the United Kingdom is an example of a publicly funded national healthcare system (NHS, n.d.). As noted, the UK initially adopted a top-down approach to HI implementation in 2002 (Wachter, 2016, p. 9). This implementation strategy was terminated 5 years later, reportedly not having achieved the intended goal of the National Programme for Information Technology (NPfIT). Factors cited as contributing to this unmet goal included ambitious, unrealistic timeframes and the omission of key stakeholders in decision-making related to design and implementation (Wachter, 2016, p. 9). In the ensuing years, the NHS commissioned an advisory group to reflect upon this UK experience as well as that of its global partners. Implementation strategies were revised and recommendations made to adopt a phased in approach, which focused on local health community needs supported by national funds. This revised implementation approach now assumed middle-out strategies and concurred with recommendations made earlier by Eason and colleagues (Eason et al., 2012, p. 55). Fragidis and Chatzoglou (2018) corroborate this trend to adopt the middle-out implementation approach noting the US followed a similar pathway, abandoning the bottom-up approach in preference for this strategy (Fragidis & Chatzoglou, 2018, p. 122).

Considering these findings, it is conceivable the current global transformation to a more patient-centric model of health founded on the inclusion of all stakeholders, particularly the patient, corresponds more efficiently, effectively and seamlessly with the middle-out approach to HI implementation (Appelbaum, Zinati, MacDonald, & Amiri, 2010). Literature often describes the inclusion of end-users in HI design and application as essential in ensuring successful HI adoption. This premise could therefore explain the prevalent utilisation of the middle-out approach to HI implementation.

The UK's plan to implement HI on a national level was successful at the primary care level with the vast majority of general practitioners adopting this technology (Wachter, 2016, p. 8). However, the goal to digitise secondary care remains a work in progress. Inherent in the effective adoption of HI is the need to educate and train the current and future healthcare workforce. The absence of this knowledge and competency is seen as a major barrier to this technological innovation (Symons, Ashrafian, Dunscombe, & Darz, 2019). In 2019, Pontefract and Wilson reported on the establishment of a National Working Group in the UK, which consisted of representatives from the academic, health and IT sectors (Pontefract & Wilson, 2019). The groups' goal was to identify domains of competence and to develop learning outcomes regarding EHR functionality and application for use by all undergraduate healthcare programmes. This collaborative approach to curriculum design, engaging expertise between and amongst the various sectors, concurs with recommendations made repeatedly throughout literature in reference to HI implementation, adoption and evaluation (Pontefract & Wilson, 2019; Topol, 2019; Wachter, 2016). The resulting six domains of competence and related learning outcomes provide essential guidance and structure to all global partners in academia. Wachter (2016) note healthcare professionals are now expected to practice in this digital environment, advising the health and academic sectors that “Such training should begin relatively early in professional education” (Wachter, 2016, p. 41).

2.11.2 HI Implementation and Education in Canada

The Canadian health system is described as federally funded. The Government of Canada elaborates that responsibility for healthcare delivery, including management of these funds, exists at the provincial/territorial level (Government of Canada, 2016). Kuo, Kushniruk, and Borycki (2011) provide further explanation, noting the Canadian health system is a combination of private and public funding (Kuo et al., 2011). The private component is combined with the publicly funded health insurance system, which receives financial support from the provincial and federal governments (Kuo et al., 2011, p. 23). Adoption of the middle-out implementation strategy understandably aligns with this health system model.

Canada Health Infoway was established in 2001 for the purpose of digitising healthcare across Canada (Canada Health Infoway, 2020). The federal government funds Canada Health Infoway. Membership consists of deputy health ministers from the provinces/territories as well as industry leaders from other sectors including public, health, legal, financial and technology. The adopted approach for HI implementation is focused at the provincial/territorial level with plans to extend this nationwide as standards and infrastructure evolves. The national e-prescribing service is an example of this middle-out strategy, launching the application in phases as each province develops and implements the supporting system architecture (Canada Health Infoway, 2020, p. 12). Recent findings from the Canadian Institute for Health Information (CIHI, 2019) indicated an increasing number of primary care physicians had adopted EMR technology in their practices (CIHI, 2020). While this may indicate a positive trend in implementation, these systems are not interoperable, suggesting the middle-out approach remains a work in progress. The strategy for a national, interoperable EHR implementation remains the primary purpose of Canada Health Infoway. Infoway's collaborative approach involves healthcare providers, EHR system providers and the public to ensure all stakeholder needs are being addressed (Kuo et al., 2011, p. 23). EHR adoption rates within each province and territory are reportedly increasing gradually. Strategies to facilitate interoperability between provinces began in 2010 and remain the current focus of strategic and operational planning at the federal and provincial/territorial levels (Canada Health Infoway, 2020; Kuo et al., 2011).

Ellaway, Graves and Green (2013) describes the preparation of future healthcare professionals in Canada for a career in this digitised healthcare system as random and without focus (Ellaway et al., 2013). Thematic review of literature opposed claims made previously, that current students of health, the majority of whom fall within the scope of 'digital natives', do not display superior aptitude or competence with technology, but rather rely heavily on explicit guidance and opportunities to apply new knowledge and skill in the practical setting (Ellaway et al., 2013, p. 283). Research by Borycki, Griffith, Reid, Kuo, and Kushniruk (2014) concurs with these findings, and report a significant improvement in student competency was noted following experiential learning with access to an EHR (Borycki et al., 2014). In spite of this, inadequate EHR training remains a concern for Canadian health education programs (Collier, 2018). Expanding its collaborative approach, Canada Health Infoway has responded by connecting with partners from the academic sector to identify essential competencies to facilitate development of learning outcomes (Collier, 2018).

2.11.3 HI Implementation and Education in the UAE

The UAE health system consists of publicly and privately funded healthcare (WHO, 2006). The federal MOH funds healthcare in five of the seven emirates, while the emirates of Abu Dhabi and Dubai have assumed responsibility for their respective populations (Koornneef et al., 2017). The health system has witnessed rapid growth in the private sector as well, with the establishment of satellite facilities from recognised, global healthcare providers (Ahmed, Al Amiri, & Khan, 2018). Since federation in the early 1970s the healthcare system has progressively developed, and in 2014 expanded its focus to include health tourism as a strategic component of its health and wellness model (Government of Dubai, n.d.). This is in direct contrast to the former practice of UAE nationals who preferred to travel abroad for their healthcare (Ahmed et al., 2018).

Plans to digitise healthcare in the UAE began in 2008 (Bani Issa & Al Yateem, 2016). While a nation-wide interoperable EHR does not yet exist, EHR implementation connecting the 15 government health facilities and 86 affiliated clinics throughout the UAE has commenced (Neamah, Alomari, Ahmad, & Nuiaa, 2018). Initiatives to connect all public and private healthcare facilities were launched in 2018, applying the Electronic Medical Record Adoption Model (EMRAM) to provide guidance (Al-Shorbaji et al., 2018). A top-down implementation method was adopted following a staged approach (Al Baloushi & Ramukumba, 2015). Research assessing the implementation process reported most healthcare professionals were generally satisfied with EHR functionality; however, this was only achieved several years following implementation (Neamah et al., 2018, p. 10). Recommendations to improve current and future healthcare professionals’ access to EHRs for training purposes were made, concurring with suggestions discussed previously (Neamah et al., 2018, p. 10).

Literature describes the national ICT sector as, “one of the most advanced in the Arab world.” (Neamah et al., 2018, p. 9). The academic sector’s response to the reportedly exponential development of this nation’s HI infrastructure is of key relevance to this research. The search for literature specifically addressing the status of HI education and training in health programs throughout the UAE produced limited results. This finding is significant to this study, indicating a decided lack of research of this specific subject area. A study by Bani Issa et al. (2020) found the lack of adequate training continues to be a chief concern amongst clinicians (Bani Issa et al., 2020). A recent systematic literature review focusing on EHR adoption in the Middle East region concurred with these findings, noting healthcare professionals did not possess requisite competence and knowledge of HI applications (Alanazi, Henderson-Butler, & Alanazi, 2020). A study of primary challenges facing healthcare in the Gulf States noted the unavailability of valid, reliable morbidity data and recommended the academic sector strengthen its educational programs (Khoja et al., 2017). However, these suggestions were made in reference to data collection policies and practices and did not specifically address the need for HI education and training.

The need to address this incompatibility between the health and academic sectors has been noted by the WHO (2016) in its *Global Strategy on Human Resources for Health: Workforce 2030*. Specifically, the WHO advises collaboration between government, health and academic sectors to establish an infrastructure for educating the future health workforce guided by unified policy development (WHO, 2016, p. 13). Review of literature investigating EHR implementation and adoption in the UAE identified the lack of suitably trained and educated healthcare professionals as a prevalent challenge throughout the health sector. Considering the strategic goal of the UAE is to establish a world-class health system by 2021, as noted by its Prime Minister, these findings would suggest there is still work to be done (United Arab Emirates Vision, 2021). As noted, a limited amount of literature was found that specifically focused on the status of HI education, training or curriculum development within health science programs in the UAE. Therefore, it may be concluded from this search of literature that a scarcity of research exists that speaks to the preparedness of future healthcare professionals in the UAE with regards to HI competence.

Review of literature regarding EHR implementation approaches and associated education and training strategies within the UK, Canada and the UAE was done. In conclusion, the middle-out implementation approach appears to be methodology of choice. The UK transitioned its implementation strategy from that of top-down to the more collaborative middle-out approach, seeking input and involvement from all key stakeholders. Contemporary reviews of plans to digitise healthcare in the UK by Doctor Wachter (2016) and subsequently by Doctor Topol (2019) both emphasise the need for continuous, collective on-going strategic planning. While Canada opted for a middle-out implementation involving representatives from government, health and public sectors, inclusion of members from the academic sector only occurred several years into the planning. The health system of the UAE launched plans to digitise healthcare using a top-down implementation. Review of literature investigating collaboration with key stakeholders, specifically the academic sector of the UAE, suggested progress in this area remains somewhat limited.

2.12 Conclusion

This literature review was done to answer two research questions. The following is a summary of findings for each of these research questions.

1. *What are the perceptions of stakeholders (faculty, students, alumni, program administration) regarding an academic health informatics module?*
2. *What are the barriers to and facilitators of the integration of an academic health informatics module?*

Review of literature suggests this group of stakeholders are aware of the need to include HI content in curricula. However, despite this a gap remains between industry's needs and graduate knowledge of and competence with HI applications, specifically the EHR. Academia was described as lacking a complete, contextualised understanding of HI. Also, some academics did not have a completed understanding of the transformation currently underway in the health sector. Accordingly, the academic sector was not fully aware of its salient roles and responsibilities with regards to the design and delivery of HI theory and training. Academia perceived HI as overlapping many professions resulting in a sense of uncertainty of the scope of responsibility as an educator. Some educators may have developed their perception of HI while working as a healthcare professional, which literature suggests is a common path taken by many in this field of academia. Development of perception in this setting was cited as dependent upon training, support and evidence of improvement to health outcomes and work efficacy. Review of literature suggested there was an urgent need to provide evidence in health informatics, a concept certain to impact perception. Most health educators reportedly had not received HI theory or training during their formative education, thus contributing to the lack of understanding of HI functionality and purpose.

Comparatively little literature was found that addressed perceptions of the academic sector in the Middle Eastern region, and specifically in the UAE. However, literature provided sufficient evidence of a keen interest in HI held by the health sector. This dearth of articles addressing perceptions of HI in the academic sector would suggest this is an area for further research.

What are the barriers to and facilitators of the integration of an academic health informatics module?

The design and implementation of HI curricula within schools of health has progressed at varying degrees amongst health professions. Examples of programs incorporating HI curricula, globally, are nursing, medicine and pharmacy. Common barriers to the integration of HI curriculum are limited time, lack of a well-understood definition and a myriad of assumptions surrounding roles and responsibilities pertaining to HI curriculum design and implementation. Once again literature search produced few articles, which specifically addressed the barriers to integrating HI curricula in the UAE. One article identified the inability to access EHRs for training purposes as the primary barrier faced by students of various health programs in the Middle East region. This finding concurred with literature addressing this topic on a global scale.

Literature noted there were many resources available to academia pertaining to HI curriculum development, particularly from organisations such as IMIA. However, further guidance pertaining to experiential learning opportunities, specifically how and when to include these in curricula was notably missing.

Facilitators to HI curriculum development and integration included communication and collaboration. The need to incorporate all stages of the systems development life cycle (SDLC) was recommended in several articles and aligns with a curriculum development model, which begins the general and then targeted assessment of need.

Literature search for evidence of this concept in the Middle East again produced limited results. Considering this and similar findings noted above, it might be concluded this area is significantly under-researched. It was originally anticipated that answers to these research questions would facilitate an in-depth understanding of this situation within the UAE academic sector and subsequently provide guidance for curriculum development. However, as a result of this literature review more questions were raised than answered, an outcome serving to reinforce the impetus for this study.

Chapter 3 – Methodology and Study Design

This chapter outlines the aims of the research. Methodology defines the theoretical underpinnings of this study and explains the rationale for using a qualitative approach. This chapter describes the process of recruitment, data collection and analysis, including discussion on reflexivity.

3.1 Aim and Objectives of Research

The aim of this research was to explore stakeholders' perceptions, knowledge and acceptance of HI curriculum in health science programs at a tertiary academic institution in the United Arab Emirates. The objective of the study is to understand and map any enablers and barriers to the inclusion of HI curriculum. Ultimately, the goal is to ascertain how well academia is preparing the next generation of health professionals for the revolution in health care informatics.

3.2 Research Setting

The setting for this research was a tertiary academic institution in the UAE. Healthcare facilities in the region had included an electronic health information system (HIS) in their strategic and operational planning. Government hospitals utilized this electronic system; plans to integrate with private and military hospitals had commenced. It would therefore seem prudent for academic institutions to equip its graduates with requisite competencies in HI. As mentioned, initial review of matrices indicated this was not the case. Borycki, Househ, et al. (2011) suggested this might be due to the lack of qualified informatics faculty. Higher Colleges of Technology (HCT, n.d.) was comprised of a network of seventeen campuses throughout the seven emirates. Clinical and allied health science programs are offered at nine campuses. Inspection of matrices and curricula revealed 'health informatics' was included in only one program. This was in complete contrast to current trends in industry suggesting the pathway to modernized healthcare delivery can only occur with the design and implementation of sophisticated technology-based information systems (Goldzweig et al., 2009).

This study was designed to examine the factors contributing to the delay in developing HI curriculum in Health Science programs at HCT. Such hesitancy toward application of health information technology is common. Ash and Bates (2005) reports on “adoption and diffusion rates” (p. 8) of health information systems, suggesting a significant gap persist (Ash & Bates, 2005). HI applications could be tailored to meet the needs of all health programs offered at HCT. Accordingly, attention was paid to commonalities and differences in beliefs of stakeholders within each division. Knowledge gained from this research would facilitate the development of relevant HI curricula to support each specialty within the program.

3.3 Curriculum Development in UAE

Review and comparison of literature had enabled a contextualized understanding of the status of informatics curriculum in the UAE. The setting of this research was the largest tertiary academic facility in the UAE. Curriculum development was often the result of shared best practices from an international group of expatriate educators. Many schools of health incorporated standards of practice and education, which translated quite seamlessly on a global basis. For example, nursing, pharmacy, medical laboratory or medical imaging practices and professional responsibilities are well established. Curriculum for these programs is also well established. Adopted curriculum was subsequently implemented in these schools of health. As the college evolved, programs were required to establish advisory committees comprised of faculty and industry partners. This step provided valuable information for both the academic and health sectors of this young country. Allegedly, assessment of stakeholder need had been omitted in the rapid pursuit to establish a product echoing that of the western world. Literature would suggest this key element had similarly been omitted on a global basis. It is conceivable that embedded in this adoption of western curriculum was a continuance of insufficient informatics curriculum.

As with other academic institutions, annual curriculum review and revision became regular practice within each school of health. In addition, monthly faculty meetings were held allowing comparison of best practice and opportunities to share knowledge. Also, similar to international partners, each school of health was required to complete an accreditation review. International accrediting bodies would be hired to benchmark and evaluate curriculum, faculty qualifications and graduate outcomes. In preparation for this research, access to program accreditation reports was obtained. In only one instance was the addition of informatics curriculum recommended by the surveyors. Literature often reports a dearth of accreditation standards specific to EMR/EHR knowledge and competencies (Wald, George, Reis, & Scott-Taylor, 2014). In consideration of literature reviewed, it would seem the status of informatics curriculum in this academic institution in the UAE had not lagged behind, but had maintained pace with its global partners.

3.4 Methodology

Initially, the research was to be mixed methodology, with plans to follow the tenets of grounded theory. The goal was to determine a theory that would facilitate an understanding of perceptions, preparedness and future plans pertaining to HI in academia. The process of gaining new knowledge would not be founded on theory but would be based on data collected during focus groups. However, as preparations for data collection progressed, it was noted that certain themes had already begun to emerge via literature review, which would form the topics to be discussed. Accordingly, the researcher considered alternate guiding approach for the research.

Thematic analysis shares a basic premise of grounded theory, which is to seek patterns in data (Braun & Clarke, 2006). The intended outcome of thematic analysis, however, is not determination of theory, but rather acquisition of a clear, contextualized understanding of the meaning of the data. Clarke and Braun (2017), in describing the usefulness of thematic analysis, suggest the researcher is able to explore participant “lived experience, views, perspectives, and behaviour and practices” (p. 297). This methodology was therefore selected as the most appropriate framework to meet the aim and objectives of this study. Initially, the decision was made to adopt the methodology of latent deductive thematic analysis, which most closely aligned with the aim of the project. Data coding and theme development was guided by the researcher’s existing concepts, thereby contributing to assumptions underpinning the data. However, as analysis of findings evolved, four key sub-themes became most evident. The analytical framework was accordingly revised to incorporate tenets of inductive thematic analysis as well.

Flexibility in design and process has been described as a decided advantage of thematic analysis methodology. Clarke and Braun (2017) refer to this attribute as a “hallmark” (p. 297) of this methodology claiming flexibility exists in every aspect of the research process, from determination of theoretical framework to determination of research question, sampling, data collection and analysis. Similarly, Guest, MacQueen, and Namey (2012) describe applied thematic analysis as a methodology that refuses to “compartmentalize” (p. 4) qualitative research and analysis into specific epistemological and theoretical frameworks (Guest et al., 2012). Further elaboration of the analytic process is found later in this chapter (see Section 3.10 Analysis).

3.5 Theoretical Framework

The aim of this research was to gain an understanding of participant perceptions and knowledge of HI as well as their envisaged plans for its use in academia and eventually in industry. Gaining insight into one's perception of knowledge and competence is a form of constructivist inquiry. Buchanan (2018) defines constructivism as "the position that reality is independent of human perception and any knowledge that we have to it is necessarily a construction" (Buchanan, 2018). Constructivist epistemology, as described by Murphy (1997) states knowledge is "constructed by the individual through his interactions with his environment" (p. 5). Expanding on this interpretation, Heylighen (1993) proposed the interaction with one's environment may be considered a form of social constructivism wherein credence, or truth, is assigned only to those constructs that achieve consensus amongst the social group with which one interacts. Heylighen contends this process of gaining consensus is the "principle criterion to judge knowledge" (p. 2). This description aligns with an assertion by Murphy (1997) that the process of knowledge construction and collaboration are fundamental elements of the constructivist philosophy (p. 13).

Exploration of the meaning assigned to HI and how participants behave or interact with this concept may also be explained by the symbolic interactionism theory. Cummings and Borycki (2011) submit the meanings individuals attribute to things "influence how they react to these objects in their environment" (p. 287). Symbolic interactionism, as discussed by Blumer (1969), suggests one assigns meanings to things as a result of interactions with others, which then influences one's interpretation of that particular construct. Applying this theory to the research project, the meaning participants assign to technology in healthcare could be influenced by their interaction with this technology as well as interactions with their peers, all delivering them to their specific interpretation and understanding.

This theme of engaging and interacting with others in one's environment to construct knowledge is a basic tenet of the symbolic interactionism theory. Herbert Blumer was among the first to advance this theory, suggesting that knowledge and comprehension are constructed “arising in the process of interaction between people” (Blumer, 1969, p. 4). Literature by Blumer (Bruce, 1988) outlines specific tenets of symbolic interactionism. These have been used to construct the framework by which this study has been conducted, analysed and discussed.

The first tenet of symbolic interactionism states, “human beings act towards things on the basis of the meanings things have for them” (Bruce, 1988, p. 293). Symbolic interactionism suggests meanings are not static but are achieved through one’s interpretation (Eckert & Nilsson, 2017). The concept of assigning meaning to ‘things’ in the field of health becomes complex when considering the diversity of professions, education, roles and responsibilities (Nilsson, Hoffland, Eriksén, & Borg, 2012). As an example, the meaning assigned to health information technology (HIT) within the health sector begins with one’s notion of this object and how this might impact them. The complex nature of this scenario is intensified when transposed upon the academic sector as educators and students work to identify, comprehend and agree upon meaning.

This leads to the second tenet of symbolic interactionism that states, “meanings are developed in the social interaction that people have with their fellows” (Bruce, 1988, p. 293). Implicit in this tenet is the concept of process suggesting meanings are acquired through a social process of learning from, negotiating and interacting with peers (Eckert & Nilsson, 2017, p. 34). As a result of this process, meaning is assigned to things or objects in one’s reality (Bruce, 1988, p. 293). This concept of things or objects is fundamental to symbolic interactionism, positing one comprehends and assigns meaning as a result of one’s interpretation of how others interact with this object. Transferring this concept to the health sector, it is conceivable the ‘actors’ in this sector assign meaning to the EHR, as an example, through interpretation of how other healthcare colleagues have acted towards this object. Similarly, in the academic sector, educators and students arrive at the meaning of a concept or object, such as applicability of the EHR in their salient field of study, through the social process of negotiation, interaction and interpretation. Literature suggests educators may not always succeed in this process and may need to employ various discursive methods to facilitate this process to acquire meaning (Blumer, 1986).

The third tenet of symbolic interactionism focuses on the concept of ‘action’, and states, “meanings are handled in and modified through the interpretative procedures used in action” (Bruce, 1988, p. 293). An individual considers an action or interaction to be symbolic because of the importance conveyed to them by those performing the action. Accordingly, an action becomes meaningful to an individual once this action elicits a response similar to that of the actors (Singlemann, 1972). As a result, the manner in which an individual acts is determined by the situation and one’s interpretation of and interaction with that situation (Nilsson et al., 2012). Applying this concept to the adoption of an EHR in the health sector, an individual develops meaning of this technology as a result of their interaction with the object (EHR) as well as their interpretation of others’ interactions with this technology. If, as discussed previously, educators in health programs have transitioned from practitioners to academics, the meaning assigned to this technology while in the health sector may have accompanied them to academia. These three tenets of symbolic interactionism, which posit one reacts to an object based on meaning, interpretation and interaction, have been used to frame this research. Exploring how providers and consumers of health education comprehend, interpret and interact with HI is the primary aim of this research. The perceptions of HI and curriculum reform are two constructs embedded in the processes of interpretation, action and interaction. Accordingly, constructivism and symbolic interactionism have been adopted to analyse these two constructs.

The first layer of this theoretical framework is that of constructivism, which allows the researcher to gain a contextualised understanding of the process by which participants construct knowledge and perception through interaction and interpretation. Symbolic interactionism theory forms the next layer of this framework whereby the definition of and interaction with a specific construct, specifically HI, as well as one's peers has the potential to enhance the determination of knowledge and perception. The last layer forming this theoretical framework enlists the principles of diffusion of innovations theory. Embedded in this theory is an interpretation of the progression and advancement of concepts encountered with the introduction of HI in academia.

The introduction of HI to academia, including the embedded technology, can be investigated and explained most effectively using the diffusion of innovation theory. Inherent in this theoretical framework is the concept of progression and advancement of constructs relating to a new innovation. During this research, diffusion of the perception of usability and functionality pertaining to HI in academia was visibly notable. Rogers, Medina, Rivera, and Wiley (2005) describe this model as a 'process' whereby new ideas are introduced and shared amongst members of a social network. The introduction and adoption of HI has been neither instantaneous nor seamless. The complex nature of the healthcare industry, the diverse levels of education, roles and responsibilities of healthcare professionals, coupled with the dynamic environmental context have all been attributed as primary causes (Greenhalgh, Stramer, Bratan, Byrne, & Mohammad, 2008). Transposing this theory on the research population, awareness, adoption and perceived usability of this innovation are anticipated to occur at varying phases.

Rogers' mechanisms of diffusion and five levels of innovativeness provided a structured framework, enabling interpretation of the evolving behavioural changes as they presented during this research. Diffusion of innovation theory identifies five adopter categories, which are involved in the spread and adoption of new ideas. These five categories are:

- Innovators
- Early Adopters
- Early Majority
- Late Majority
- Laggards

A detailed discussion of these categories as they apply to this research may be found in Chapter 5. To facilitate further detailed exploration and explanation of this theoretical model, Greenhalgh, Robert, Macfarlane, Bate, and Kyriakidou (2004) describes distinct factors that influence the adoption of an innovation. A summary of these factors is found in Table 6.

Table 6: Factors Influencing Adoption of Innovation

Factor Influencing Adoption of Innovation	Description
Relative Advantage	• Degree to which an innovation is seen as getter than the idea, program, or product is replaces
Compatibility	• Consistency of innovation with values, experiences and needs of potential adopters
Complexity	• Degree of difficulty to understand and/or use the innovation
Trialability	• Ability and extent to which the innovation may be tested prior to commitment to adopt
Observability	• Extent to which the innovation provides tangible results

Source: Diffusion of Innovations in Service Organizations: Systematic Review and Recommendation (Greenhalgh et al., 2004).

Braun and Clarke (2006) submit the flexibility of thematic analysis permits application of various theoretical frameworks. While each of the aforementioned theories supports this research project, it is felt the structured nature of the diffusion of innovation theory best aligned with the research question as well as with the project as it evolved. Therefore, the findings and subsequent discussion employ this theoretical framework.

3.6 Research methods

In order to meet the aims of the research the first task was to identify the relevant stakeholders, whose perspectives would be sought via data collection. The next task was to identify the most appropriate tool for data collection. The following sections outline the stakeholders and the chosen qualitative method for data collection.

3.6.1 Identifying Stakeholders

In an academic organisational framework, a stakeholder has been described as a constituent of an organisation (Wagner et al., 2008). Accordingly, stakeholders of HI education are those that are affected by it. The philosophy underpinning this research is symbolic interactionism as fundamentally, this closely concurs with the research purpose and methodology. Essentially, this philosophy posits the manner in which an individual or group interprets an object, concept or situation is influenced, initially by the meaning attributed to that concept or object and subsequently, by the interactions amongst the group to that concept or object. Accordingly, the meanings and perceptions ascribed to HI through its various phases of teaching, learning and application form the basic framework of this research. A list of the main stakeholder groups has been compiled along with a justification for their inclusion in this research.

The first group to be included in this study is the academic management team, consisting of program chairs, associate and executive deans within the Health Science division. This section determines the organisational culture within which teaching and learning takes place. Westrum (2004) describes three types of organisations: pathological, bureaucratic and generative submitting that performance is directly influenced by organisational culture. Westrum describes a generative organisation as one that ensures the right information is delivered to the “right person in the right form and in the right time frame” (The Three Cultures Model section, para. 5), all commendable attributes, and clearly the optimal goal of any educational organisation. With this in mind, it was essential to gain a clear understanding of this group’s views on HI and its role in academia.

Faculty (college staff) have a responsibility to provide current, relevant tuition. Literature contends the “importance of health informatics as a tool – indeed a unifying mechanism – within health care is now globally self-evident” (Rigby et al., 2013, p. 44). Hence, the need to include access to the relevant theory, knowledge and practice of informatics in education is similarly self-evident.

Students pursuing a career in health care have a responsibility and an expectation to be well versed in HI theory and application. As such, it is essential to obtain their perspective and opinion regarding this resource.

Alumni employed in the healthcare industry are also seen as key stakeholders. Gaining insight into their experiences might provide valuable detail and context relating to the need for prior HI education and training because of their recent experiences in both settings.

The purpose of this research was to determine stakeholders’ perceptions and knowledge of HI, pertaining to development and integration of biomedical/HI curriculum. Noted differences in perceptions between various stakeholders would enhance a contextualized understanding. The research sought to determine what impact these differences in perceptions may have had on development of HI curricula. Inherent in this study was an exploration of the potential to mitigate any differences between and amongst stakeholders.

Analysis of data collected during focus groups allowed the researcher to conceptualize latent social patterns and structures relating to the development and integration of HI curriculum. The study had the potential to increase understanding about attitudes and reasons for adoption and integration of HI curricula within the HCT network.

3.7 Focus Group Methodology

Qualitative design focuses on meaning and interpretations of one's reality (Marshall & Rossman, 2011). Focus group research empowers participants to examine and share their attitudes, beliefs, experiences and reactions, potentially their 'reality, in a non-threatening environment (Gibbs, 1997). This format would allow the researcher to gain a contextualized perspective of stakeholder knowledge and perceptions of HI. Accordingly, focus group methodology was chosen. Qualitative methods may use various modes of data collection adopting the tenet that 'truth' has various interpretations. Participant interviews were considered as an alternate data collection tool. However, as this format precludes any potential for participant interaction, it was deemed inappropriate for this research.

Kitzinger (1995) suggests a fundamental strength of focus groups is this ability to interact whereby participants are encouraged to share experiences and opinions. A goal of this research was to gain an understanding of participants' perception of HI. Inherent in this was the need to ascertain their experience with this relatively recent innovation in healthcare. Elements of interaction with professional peers as well as the technology itself were seen as critical to enabling the author to gain a valid perspective of participant reality.

Various forms of communication are integral to focus group dynamics and enable a comprehensive understanding of perceptions, beliefs and experiences. A considered response to a research question might not yield the full or exact details of one's knowledge and understanding. Discussions and debates amongst participants could elicit multiple and diverse views. By using various means of communication, both spoken and unspoken, the author was provided with an in-depth understanding of participants' true beliefs and attitudes (Kitzinger, 1995). Ultimately, focus groups were felt to provide the most optimal means to capture this 'truth'.

3.7.1 Limitations of Focus Groups

As with any research methodology, certain limitations exist with focus groups. Participants are encouraged to share personal beliefs and experiences with peers. This concept may be seen as intimidating to those who are shy and less confident in either their communication skills, their knowledge of the topic, or both. The researcher may potentially minimize this by encouraging participation while ensuring a non-threatening, non-judgmental environment. Making eye contact with shy participants, or having them sit next to the moderator, are tools that may be used to encourage their participation (Liamputtong, 2011). Group dynamics have the potential to facilitate discussions as the less-inhibited participants "break the ice" (Kitzinger, 1995, para. 9) and provide mutual support to the more reticent members of the focus group.

This methodology is neither confidential nor anonymous. Participant conversations occur openly and were recorded. Verbatim transcripts were shared with all participants following the session. While each participant's identification was anonymised, the potential to recall the source of each discussion remained. Careful planning and moderating may minimize this limitation. Information packages and informed consents had been provided and discussed at the beginning of each focus group. Participants were reminded they were free to end their involvement in the focus group at any time.

A fundamental feature of this methodology is the group dynamic. Accordingly, the facilitator must be cognizant of the fact that responses are not necessarily the individual's opinion, but may have been influenced by the context and culture of the focus group (Gibbs, 1997). Determining the discrete meaning of discussions may therefore become difficult.

3.7.2 Planning and Establishing the Focus Groups

Planning for focus group research involved careful attention to detail. To assist with this process Tong, Sainsbury, and Craig (2007) developed a checklist entitled, "Consolidated Criteria for Reporting Qualitative Research" (COREQ). This framework has been used to guide the relevant phase of this research.

Morgan (1997) suggests there are three fundamental items to consider when planning focus groups: ethical concerns, budget issues and time constraints. As discussed previously, invasion of privacy is an intrinsic element of the focus group format. This and other ethical considerations and the plans designed to address this may be found further in this discussion (see Section 3.9 Data Collection).

Budgetary issues were minimal. The research project was self-funded and staged at the researcher's place of employment. Technology supporting synchronous online focus groups prevented the need to travel to various campuses throughout the academic network involved in the study. Some members of faculty, student and alumni focus groups joined the sessions online using Zoom™ video conferencing. Thus, many sessions consisted of both face-to-face and synchronous online meetings. Fox, Morris, and Rumsey (2007) suggest that in addition to advancing research methodologies to maintain pace with current technology, this format provides an alternative to those “unable or unwilling to engage in conventional face-to-face focus groups” (p. 539). Employing this resource addressed issues of design limitation as well as budgetary concern. The author was responsible for all expenses including purchase of a laptop, recording devices, and coding software (NVivo). Arrangements had been made for a co-moderator to facilitate focus groups; payment was offered but declined. No incentives to participate were employed other than providing refreshments during each session.

The issue of time constraints required careful, ongoing consideration; research schedule was established, revisited and updated routinely throughout the project, in consultation with the research supervisor (see Appendix B). Focus groups proceeded according to schedule. However, transcription was found to be very time-consuming as was the subsequent analysis. Transcripts were forwarded to participants following each session for feedback, which was received in a surprisingly timely manner. The participant engagement and concomitant empowerment was most noteworthy; elaboration of this dynamic is addressed in Chapter 5.

3.8 Sampling and Recruitment

The research setting was the Higher Colleges of Technology in the United Arab Emirates. Health Science programs are taught at nine of the seventeen campuses. Initial focus groups were scheduled at two campuses. Stakeholders involved in HI throughout various stages of teaching, learning and application hold information and knowledge of key importance to this research. Accordingly, four principal groups have been identified as the strategic population for inclusion: health science teaching staff, academic management, students and alumni. Participants were recruited from nine campuses. Each participant group was approached sequentially, beginning with faculty, academic management, students, and concluding with employed alumni.

3.8.1 Sampling Strategy

The population equipped to participate in discussions about HI represented distinct groups within the broader population of academia. Therefore, purposive sampling, providing non-probability samples for selection, was used. Ritchie and Lewis (2003) suggest this strategy appropriately aligns with qualitative research, whereby “units are deliberately selected to reflect particular features of or groups within the sampled population” (p. 78). This strategy focuses on the characteristics of the population as the main selection criteria. Purposive sampling permitted the selection of participants who would facilitate exploration and understanding of the three core themes; perceptions, knowledge and experiences pertaining to HI in academia. This sampling method ensured all subgroups of the population were adequately represented (Trochim, 2006). Participants representing each of the four principal groups were selected. This ensured the key stakeholder constituencies were included and that diversity in the study population was addressed.

Kitzinger (1995) suggests homogeneous group composition allows for free-flowing conversations amongst participants and is common in focus group research. This emphasis on homogeneity within the study population would support analysis of differences and commonalities within and amongst participant groups. As such, generalizability of findings was not anticipated as the investigation focused on a salient population, in a specific location and context (Leung, 2015). Sampling strategies were selected with the emphasis on minimizing sample bias. Grouping the population into homogeneous strata served to reduce sampling error, thereby facilitating collection of quality data. Therefore, this format of sampling and group composition were selected, having determined this best supported the aim and purpose of the project.

Literature suggests there is little consensus on quantity of the sample but rather on quality and richness of the data, suggesting a sample size of six to ten is sufficient (Rowlands, 2005). The sample size must be adequate to produce enough data to facilitate meaningful analysis. Selective sampling strategies for each participant group are detailed here. A total of fifty-three volunteered to participate in focus groups as outlined in the Focus Group Schedule (see Table 3: Focus Group Schedule).

Key (1997) has suggested that it is not acceptable to generalize findings produced as a result of purposive sampling. However, the aim of this research was to advance knowledge in context from qualitative study, rather than to ensure generalization. However, analysis and subsequent discussion allowed the researcher to identify how generalization of these findings could proceed, if only within the broader scope of this population involved in the study.

3.8.2 Recruitment

The research was introduced to teaching staff and academic management at a regularly scheduled Health Science Division meeting (which all faculty attend) and volunteers sought. An email was sent to potential student and alumni participants, including an introduction to the project and an invitation to contact the researcher if they wished to participate. Focus groups were arranged. Information packages were given to potential participants for their consideration (see Appendices C, D, E and F) and consent was taken prior to the focus groups (see Appendices G, H, I and J).

3.8.3 Planning

Three faculty focus groups were planned. Due to geographic distances, a combination of face-to-face and synchronous online meetings was scheduled. Academic management, consisting of the academic dean, two associate deans and five program supervisors were invited to participate; six were able to attend. A sample of 10 students from each Health Science program was contacted, allowing for participation from clinical and allied health areas. Two volunteers from each program were selected randomly. Twenty-one students participated in the study. Four focus group sessions were planned.

Alumni were divided into two groups: those who have had some form of HI tuition and those who had not. Focus group research submits a small sample size is appropriate when dealing with a homogeneous group of participants, such as ‘Alumni’ (Cummings & Borycki, 2011). Eligible participants will have graduated from a health science program at HCT within the past 10 years. The researcher was able to determine if the graduate received HI tuition according to the year of enrolment and review of relevant matrix. Ten alumni volunteered to participate in the study. This group consisted of five employed alumni who had some HI tuition and five employed alumni who did not. The candidates were selected randomly from the relevant list.

A Focus Group Plan (see Appendix K) was developed comprising of a schedule indicating the number of sessions planned, meeting location and a tentative time frame. Focus groups with academic management, faculty and students were scheduled during the academic year; Alumni sessions were held after it ended (see Table 7).

Table 7: Focus Group Schedule

Participant Group	No. of Focus Group Meetings	Total No. Of Participants	Date	Location
Pilot Focus Group	1	4	Mar 2015	On-campus meeting (All face-to-face participation)
Faculty	3	16	Apr 2015	On-campus and online meetings (Two sessions involved combination of face-to-face and online participation)
Academic Mgmt.	1	6	May 2015	On campus meeting (All face-to-face participation)
Students	4	21	Apr through Jun 2015	Campus site visits and online meetings (All sessions involved combination of face-to-face and online participation)
Alumni	2	10	Jul through Sep 2015	Site visits and online meetings (One session involved combination of face-to-face and online participation

3.9 Research Ethics Approval

Participants in this study were all affiliated with the Higher Colleges of Technology (HCT) in UAE. Application for research ethics approval was sought through the Research Ethics Review Board of HCT. The required documentation was submitted to the Board and the researcher was invited to present a brief of the proposal. Ethical approval was granted June 6, 2014, allowing the project to proceed amongst all campuses of the HCT network.

The University of Bath Policies and Regulations require all researchers to comply with all UK and international regulations by applying for ethical approval from the relevant authorities prior to conducting any studies. These laws are to ensure participant privacy is protected and that no harm will come to them as a result of the research project (Greaney et al., 2012). Following review of the Research Ethics Approval documentation, ethics approval was obtained from the Research Ethics Approval Committee for Health at the University of Bath (see Appendix L). Once the approval was given the study was initiated.

3.10 Data Collection

A Focus Group Guide (see Appendix M) was developed which provided an outline of discussion areas to be addressed with each participant group. Framing questions were then developed and a template drafted, including introductory statements and sample questions for each group (see Appendix N). The format for each session and the basic premise of questions posed to each participant group were similar. This framework aligned with the deductive approach to the study and the aim of the project. Meetings were scheduled with some participants attending in person while others joined online. Research indicates synchronous online conferencing may be beneficial, providing participants with a more comfortable environment where dialogue is “candid and insightful” (Fox et al., 2007, p. 545). This was demonstrated often, with those attending online contributing more frequently and in a frank, uninhibited manner. Offerings from those attending in person initially appeared careful and guarded. Online conversations were documented using both video and audio recording. Permission to use audio and/or video recording was sought at the initiation of the project; participants were reminded that all conversations were being recorded. Ethical considerations including privacy have been described as “no more hazardous than those associated with conventional methods (Pittenger, 2003)” (Fox et al., 2007, p. 541).

A pilot focus group was arranged with faculty volunteers from various programs, excluding Health Sciences. This provided an opportunity to practice facilitating the various components from introduction through to completion and wrapping up. Participants were provided with a transcript following the session, feedback sought and accordingly the focus group schedule was revised.

Focus groups were then conducted beginning with faculty. Arrangements were made with a staff member from the English department to facilitate faculty focus groups, as the participants were colleagues of the researcher. This provided an additional opportunity to observe format, interactions and to record notes. Three focus groups were held with a total of sixteen faculty. Each session involved both face-to-face and synchronous online meetings with participants. Audio and visual recordings were collected. A faculty from the Education division volunteered to assist with all faculty focus groups, recording the session and providing additional notes on participant interactions.

One focus group was conducted with academic management. It took place at the conclusion of a monthly divisional meeting, providing the opportunity for a face-to-face meeting with all members of the Health Sciences academic management team.

Four student focus groups were conducted involving 21 students from several campuses throughout the college network. Again, a combination of face-to-face and synchronous online meetings was arranged. Two alumni focus groups were held with a total of 10 participants. As alumni were employed in various settings throughout the UAE, a combination of site visits.

Audio and visual recordings were made of all focus groups. Following each session, discussions were transcribed and a copy was sent to all participants for review and feedback. Few provided feedback and most were in the form of a commentary, discussing their experience as a participant. Edits were incorporated in the final edition of each transcript (see Appendix O).

3.11 Analysis

When choosing Thematic Analysis, several key decisions must be made when determining the thematic map of a project. Braun and Clarke (2006) advise the type and level of analysis should be explicitly defined early in the research process. The researcher engaged in on-going reflexive dialogue with these decisions throughout the investigative and analytical process. Discussion of the iterative and reflexive process inherent in this research design follows.

3.11.1 Deductive/Inductive Thematic Analysis

As outlined at the start of this chapter a deductive thematic analysis approach was chosen. The researcher determined three core categories of interest, or themes, during the initial review of literature. The aim of the research was to collect and analyse the data with a specific research question in mind. This aligns with a theoretical or deductive analysis approach with the project being analyst-driven (Clarke & Braun, 2017). The following three key areas of interest were identified at the beginning of the research process:

- Perceptions of HI
- Preparedness for HI
- Future plans relating to HI

However, components of inductive analysis were also used, whereby transcripts were carefully reviewed for themes and trends, which consequently guided the inquiry. This exploratory approach to analysis allowed the researcher to identify sub-themes, which ensured that new, or emergent themes were noted during data analysis. While not ascribing to a pure hybrid approach, this being essentially a deductive qualitative design, components of both deductive and inductive analysis served to facilitate a systematic and thorough coding process. Fereday and Muir-Cochrane (2006) suggest this approach enables examination and discovery of the qualitative richness of the data, thereby contributing to enhanced interpretation and understanding.

Thematic analysis requires the researcher to determine the level at which themes will be identified. A deductive thematic analysis methodology had been adopted. However, as the project proceeded, it became necessary to determine the level at which sub-themes were considered noteworthy and of significance.

The goal of this project was to interpret and gain an understanding of perceptions and knowledge of HI in academia. Thematic analysis at a latent level permits such exploration and evaluation of fundamental concepts and beliefs. Conversely, analysis at the semantic level yields a more explicit description and analysis of the data. Investigation at the latent level complemented the aim and objectives of this research. It was therefore determined to be the most appropriate level of thematic analysis. Interpretation of data collected relating to each theme and sub-theme has been supported by and referenced to participants' quotes, which is discussed in detail in the Chapter 4.

3.11.1.1 Analysis: Stage 1

The structured nature of thematic analysis incorporates six distinct phases designed to guide the study. Braun and Clarke (2006) provide a description of these phases thus providing valuable direction, particularly to those new to qualitative investigation (see Table 8).

Table 8: Phases of Thematic Analysis

Phases of Thematic Analysis
1. Familiarization with data:
2. Generating initial codes:
3. Search for themes:
4. Reviewing themes:
5. Defining and naming themes:
6. Producing the report:

Source: Braun, V., Clarke, V. (2006) Using Thematic Analysis in Psychology.

The framework described by Braun and Clarke (2006) was used to conduct the thematic analysis. The first stage involved iterative review of transcripts, familiarization of the data while searching for common words and phrases. Initially, a colour-coded list was created, with commonly used words or phrases from each participant group being assigned a colour (see Appendix P). Following this, a separate listing was created for each group, facilitating closer scrutiny and determination of sub-themes within each core theme (see Appendix Q). Repeated examination produced a catalogue of sub-themes, which had appeared throughout all participant group transcripts. A checklist incorporating relevant sub-themes within each key theme was developed. This provided a framework for coding and subsequent analysis (see Appendices R, S, and T).

Initial codes were developed, as part of the second phase of thematic analysis. The coding software, NVivo, was used to support this process. A file was created for each participant group: academic management, faculty, student and alumni. Transcripts from each participant group were then uploaded into NVivo. The three key themes were created within each groups' file: Perception, Preparedness and Future Plans. The uploaded documents were reviewed again and elements from each coded according to the identified theme. Following this, further inspection of each theme was performed and quotations supporting sub-themes were identified and coded (see Appendix U).

The process of searching for and reviewing transcripts for themes represents phases three and four of the thematic analysis framework (Clarke & Braun, 2017). A thematic map had been developed; elements within each component of this map were then reviewed repeatedly. This recursive process provided the opportunity to refine the analysis, ensuring each group's story had been completely and accurately captured to the point of saturation. In accordance with deductive thematic analysis, the key-themes had been determined at the beginning of the process. Throughout this process of iterative assessment, sub-themes had been identified and defined, thus addressing the fifth phase of this analysis. Commonalities amongst and between participant groups materialized, confirming the significance and relevance of each concept.

The coding system developed was well defined and served to minimize any potential to misinterpret neither the definition assigned to the code nor the context of the quotation ascribed to the code. The process of data collection, coding and interpretation continued until the point of saturation when no new sub-themes or categories were detected. Analysis of these findings was then summarized and may be found further in this report.

Decisions pertaining to the 'keyness' of sub-themes evolved as the project progressed (Clarke & Braun, 2017). Criteria used to determine importance are independent of prevalence; a concept mentioned only once might provide valuable insight into the main theme under study. This situation occurred on occasion throughout this research project. A concept described only once was felt to be of equal importance to those discussed repeatedly throughout the focus groups. Because of the flexibility inherent in thematic analysis, the researcher was able to make these decisions as and when the opportunity was presented. Examples of these scenarios will be highlighted in further discussions.

3.11.1.2 Analysis: Stage 2 Comparing themes across participant groups

The researcher summarized key components of each sub-theme within each core category for each of the four participant groups. A basic framework was created to facilitate a standardized approach to analysis of each theme (see Table 9).

Table 9: Focus Group Summary Framework

Focus Group Summary Framework
• Participants' statements • Analysis • Findings as a result of Focus Group • Theme • What does this tell me about 'sub-theme' relating to health informatics? • Quotes

Participants' statements for each sub-theme were established. Reflective analytical statements were then listed as a possible explanation for each statement of fact. Findings that became evident as a result of the focus group were listed and then mapped back to the sub-theme. The framework concluded with a reflective statement describing knowledge gained as a result of the process. Quotes from each participant group pertaining to each sub-theme were extrapolated from the NVivo summary to support these decisions and discussions (see Appendix V). This analytic approach was applied to each sub-theme for every participant group.

The next phase of this analysis involved collating and summarizing the basic deductions made from each participant group, according to sub-themes within each core category. Again, a framework was created to enable a standardized approach to comprehensive analysis of all concepts felt to be relevant and pertinent (see Table 10).

Table 10: Final Summary Framework

Final Summary Framework
• Differences amongst Participant Groups • Differences between Participant Groups • Similarities amongst Participant Groups • Similarities between Participant Groups • Strongest theme per Participant Group • Evidence of sharing and understanding each other's insights • Examples of wanting to make change • Examples of innovation • Examples of taking action to improve current systems • Conclusions

Elements from the Focus Group Summary Framework were transferred to the final summary and further assessed using the above criteria. Iterative reflective analysis of information within the initial summary facilitated the identification of similarities and differences amongst and between participant groups. This, in turn, supported the determination of the most prevalent premise within each sub-theme. Additionally, examples of shared insights innovations to affect change and determination of best practice were emphasized. This concluded with development of a final summary of the data analysis (see Appendix W). This process was followed for each of the three core categories.

The sixth phase of thematic analysis involves production of a report, which summarizes findings, supported by relevant participant quotes. The initial draft of findings from this thematic analysis included analysis of each participant group's discussions. As this proceeded, it soon became evident that commonalities existed between Academic management and faculty, and between students and Alumni. Accordingly, the four participant groups were subsequently assembled into two fundamental units. Academic management and faculty participant groups were classified as providers (being considered as providers of HI tuition). Alumni and student participant groups were combined and classified as consumers (being considered as consumers of HI tuition). Emerging commonalities as well as the obvious alignment of themes, discussions and perceptions of the aforementioned four groups supported this decision. The rationale for this decision was founded on the need to improve readability of and accessibility to the context and analysis of these findings. A comprehensive report of Findings and subsequent Discussion may be found in subsequent chapters.

3.11.2 Validity and Reliability

Literature suggests the terms ‘reliability’ and ‘validity’, while requisite components of quantitative study, should more appropriately be redefined as ‘credibility’, ‘applicability’ and ‘consistency’ when used in reference to qualitative research (Golafshani, 2003). These three elements where therefore incorporated throughout the data analysis process.

Transcripts were monitored closely to ensure they contained no mistakes. A crosschecking system was developed in collaboration with a researcher from another academic institution in the region. A well-defined coding system was developed which guided analysis and interpretation of the data.

Reliability is achieved when an “accurate representation of the … population” (Joppe, as cited in Golafshani, 2003, p. 598) is consistently produced over time. In qualitative research this may be less relevant due to the small numbers of participants and the greater depth of data collected. However, the researcher endeavoured to include a wide range of participants within each focus group. As the setting was a women’s college, the participants were predominantly female; seven males, members of academic management or faculty, participated in the study.

Findings from within and across participant focus groups were compared to determine if any similarities existed, which served to establish validity. Member checking was employed, asking participants to review a summary of findings, indicating accuracy. A second researcher, with qualitative expertise, reviewed the schedule, some of the data and provided critically review of the analysis (Creswell, 2009).

3.11.3 Reflexivity

Qualitative methodology has been adopted to explore participants' perception of HI. It is anticipated that discussion of one's competence and experience with HI may be embedded within this exploration. Engaging participants in this dialogue, with a view to constructing an understanding of their perceptions presents as a subjective undertaking. Literature suggests this is because the "researcher is the instrument for analysis" (Starks & Brown-Trinidad, 2007, p. 1376). Drew (2004) emphasizes the need for objectivity throughout the research process, describing this as "the hallmark of credible research" (p. 215). The potential exists for the researcher, however unintentional, to convey preconceptions of the research topic upon every phase of the project. Reflexivity plays an essential role in qualitative research, providing researchers with tools to effectively recognise and mitigate any predispositions, thus allowing for unbiased data collection and analysis. This process of bracketing is strategically placed "between the researcher and the research project as a mechanism to both protect and enhance the research process" (Drew, 2004, p. 88).

Gearing (2004) describes bracketing as a process wherein the "researcher suspends or holds in abeyance his or her presuppositions, biases, assumptions, theories, or previous experiences to see and describe the phenomenon" (p. 1430). This process should continue throughout the entirety of the project, beginning with explicit acknowledgement of researcher preconceptions from the initial planning stage onward (Tufford & Newman, 2010). Methods of bracketing include memo writing, reflexive journaling and interviews with individuals not involved in the research, designed to facilitate the exploration and possible identification of unforeseen preconceptions. Accordingly, each of these bracketing methodologies, intended to mitigate the potential negative impact of transferring personal opinions, interests and beliefs, were incorporated throughout this study. The following is acknowledgement of the researcher's preconceptions regarding the research aims, methodology, data collection and analysis as well as a discussion of bracketing methodologies used throughout the research project.

The researcher was a faculty member and, therefore, known to many participants. Focus on the relationship between the researcher and participants in this qualitative study were maintained throughout the entire research journey. As the researcher was a colleague and instructor, care was taken when introducing the research topic and posing focus group questions. This was done to prevent participants' inclination to alter their attitudes, beliefs and behaviour. The phenomenon of EHR knowledge and competency, specifically pertaining to its presence in curriculum and experiential learning, was introduced in the information package provided to all participants. This material was shared with a colleague outside the Health Science department to ensure the topic was addressed in a factual, nonbiased manner.

The researcher was an employee of the academic institution where the study took place. Members of academic management, faculty, students and alumni of this organisation were participants of the project. The former two groups were colleagues of the author. It was considered important to acknowledge these relationships as the potential to impact and influence data collection and analysis was significant. As the researcher was a colleague, instructor and employee of this academic setting, maintenance of relationships and reduction, if not eradication, of any sense of hierarchy was critical. Reflexivity involving social critique (Mantas et al., 2010) addresses this imbalance and the need to deconstruct any implicit or explicit reference to authority. Focus groups involving academic management consisted of participants of most senior positions within the division. Posing questions, which revealed inadequate and ineffective communication, for example, were situations approached with respect and attentiveness. Discussions concerning an under-utilized academic informatics resource exposed the deleterious degree of ineffective communication within this group. Being seen as the instigator of and witness to the realization of this issue was a difficult position for the researcher. A determination to allow the conversation to unfold in 'selective silence' was made. What transpired was first an individual then collaborative retrospection of roles, responsibilities and events. The discussion was felt to reveal strategic insight into the status of informatics curriculum. This discourse was transcribed and a verbatim report provided to participants. Memos were written during the transcription and analysis of this and every conversation, enabling the researcher to focus on the aims of the investigation rather than the impact this scenario could leverage upon the author as a colleague. The author also held interviews with a trusted colleague during and following data collection with the goal of identifying any preconceptions and establishing an interface between the researcher and the research data.

A second role of the author was that of educator. The researcher knew alumni and student participants; a relationship pre-existed the research project. Reflection and planning prior to these focus groups invoked an approach of openness, encouraging participants to share experiences, strategies and insight. Information packages were provided to all participants, outlining the aims and purpose of the project. Inclusion of explicit research questions was avoided.

Literature recommends this practice as an attempt to reduce the Hawthorne effect whereby participants provide responses seen as agreeable and acceptable to the researcher, thus not revealing their innermost thoughts and beliefs (O'Holleran, Barlow, Ford, & Cochran, 2018). Information and plans were shared in a lateral rather than hierarchical organisational framework.

The researcher held the position of academic lead faculty with a master's in HI. As such, the researcher acknowledges a keen interest in ensuring curriculum is relevant, current and appropriate. Qualitative research places the researcher in the centre of the process—initiating, recording, transcribing and analysing thoughts, perceptions and experiences. This research was undertaken to provide the researcher with an enhanced understanding of these concepts and constructs with the ultimate goal of leveraging a positive influence on curriculum design and delivery. Literature suggests research is a "joint product of the participants, researcher and their relationship" (Finlay, 2002, p. 212).

Golafshani (2003) suggests credibility of qualitative research "depends on the ability and efforts of the researcher" (p. 600). The interpretation of findings and determination of themes necessitated careful consideration of both the phenomenon studied, as well as the researcher's assumptions and past experiences. Reflections and memos were documented routinely. This practice of reflexivity also served as an audit trail, providing an opportunity to convert the researcher's thoughts and assumptions into text, facilitating further evaluation and action. As a result, the researcher avoided the temptation to focus on certain quotations while relegating others to the background. The selection and ordering of themes and participant quotations may be influenced by the researcher's preconceptions. For this reason, it was deemed essential to reflect upon these assumptions and conclusions concurrently. The need to provide an environment of transparency and trust was imperative.

However, to claim complete eradication of any underlying personal opinion is not possible. The intended goal of this practice was to enable more thoughtful analysis and documentation of findings.

The last component of reflexivity involves discursive deconstruction. Reflection on context and meanings assigned to concepts described and discussed in focus groups was done, identifying episodes of ambiguity and misrepresentation. If such instances were detected during a focus group, questions surrounding the situation were posed to the participants, thus seeking clarification. Feedback from review of transcripts also provided the opportunity to follow-up with participants and established meaning assigned to certain responses. Interviews with trusted colleagues who were not involved in the research project were also held. This allowed the researcher to explore her perspectives by sharing observations, memos and notes. Questions and discussions seen as biased, ambiguous or unclear were discovered and acknowledged. As a result, analysis and discussion of findings was reflective of participants' perceptions, beliefs and values.

A journal was maintained throughout the course of the research. Review and reflection on entries informed methodology, analysis and summation of findings. The manner in which the research project was approached was influenced by the researcher's own professional background, work experience as well as by the researcher's supervisors and employers at the college.

Through progression of focus groups, the methodology evolved and the research was often taken in new and unexpected directions; another testimony to the flexibility of this research design. Elements of mutual collaboration were noted throughout the focus groups. Discussions of participant experiences and new and/or renewed knowledge resulted internal scrutiny of the environment and re-directed questions. An example of this is when an Alumnus suggested the healthcare environment did not know what to do with

HI, attributing this to a lack of policy and procedure. This simple statement of that participant's reality informed and directed questions asked and answered during focus groups. As discussed previously, transcripts were submitted directly following focus groups for feedback. This process enabled development of mutual collaborations during and following focus groups.

Reflection on meanings assigned to HI as well as experiences with this technology was embedded in the development of questions and subsequent analysis of discussions. The researcher reflected regularly on the impact that her preconceptions might have had on both data collection and analysis. A daily research diary was kept throughout the entirety of the study to record the researcher's thoughts and feelings. Continued introspection was maintained throughout the term of the study.

Intersubjective reflection encompasses an investigation of mutual meanings and understanding, which emerge during the relationship that develops during focus groups. The very nature of questions posed would have allowed participants to gain insight into the researcher's comprehension, opinion, and perception of HI in academia. These issues were clearly outlined and defined in the Information Package provided to all participants.

Of particular note was the influence of the focus group itself. Providing an opportunity to meet and communicate with peers proved most beneficial for both the participants and the researcher. These sessions became a forum for change, as insights were shared and new innovations identified and planned. Observing and analysing this exchange provided recurring opportunities to contextualize conversations and actions. This scenario may also be subject to the Hawthorne effect wherein participants react to being observed by the researcher as well as their peers. Literature refers to this as "participant reactivity" (Paradis & Sutkin, 2016, p. 32). Every attempt was made to prevent this by encouraging participants to speak honestly and openly.

3.12 Summary

The aim of this research was to investigate how well academia prepares future healthcare professionals in the use of HI. An additional goal was to gain an understanding of how the various participants produced and reproduced meanings pertaining to their salient application of this technology within this social, cultural and regional context. In this chapter I have outlined reasons for the choice of methodology and have described in detail the planning and conducting of focus groups as well as the process of data analysis. In the subsequent chapter the findings are presented.

Chapter 4 – Findings

Interpretation of findings was initiated using three pre-determined core categories of interest pertaining to HI; (a) perceptions, (b) preparedness, and (c) future plans. Iterative review of data subsequently identified four distinct sub-themes: (a) communication, (b) confidence, (c) responsibility, and (d) curriculum. These sub-themes notably affected perceptions, preparedness and future plans and therefore formed the framework of this analysis.

4.1 Communication

Issues pertaining to communication were the most prevalent of all sub-themes. The potential to influence perception, preparedness and future plans was noteworthy. The process, status and recommendations pertaining to communication are discussed here.

4.1.1 Role of Communication in Poor Provision of Health Informatics in Curriculum

4.1.1.1 Definition of Health Informatics

Analysis highlighted the state of communication within and amongst health science programs and the effect on teaching and learning. This theme documents the process that participants went through to co-construct a definition of HI in relation to academia and the healthcare industry.

a. Providers

Analysis revealed initial hesitancy to offer a definition of HI. It was suggested this was simply another term for the use of technology in healthcare, such as the electronic health record (EHR), laboratory or medical imaging equipment, databases used as archives, pharmacy inventory, without further elaboration. Interestingly, there was no mention of one of the first applications of HI, picture archiving and communication systems (PACS) which connects global expertise in radiology, even though the Chair of that program was in attendance.

Preliminary analysis suggested an inability and/or unwillingness to determine if the use of technology did in fact equate to HI, corroborating the sense of hesitancy to enter into the discussion.

As provider focus groups progressed, participants identified that technology was essentially the basic framework of HI. The critical purpose of this technology was to support sharing information with all stakeholders thus facilitating decision-making.

> *Health informatics, to my understanding, is the study of health information systems used specifically in the healthcare environment. What health informatics is all about and how it is applied, and how do we use it in the healthcare environment, is basically referring to health information systems and the use of applications in the health information context. (Participant 1, Faculty FG 1)*

This discourse engendered suggestions of further applications including support of patient education, compliance with treatment, family support, epidemiological studies, health management issues including budgeting, utilization and more. These topics will be discussed in further sections of this chapter.

As sessions progressed, it was conceded HI was more than an information system. This conversation served to suggest participants still held to the concept that a ‘system’ was a ‘database’ or a ‘record’. Eventually, a definition was offered and accepted.

> *Health informatics is technology that enables healthcare professionals to present and provide the best possible patient care. (Participant 2, Faculty FG 2)*

Initially, analysis suggested an understanding of HI that was limited to essential tasks performed either as an academic or as a healthcare professional, asserting there was no time to learn more. At the conclusion, providers identified expanded usability and functionality including the impact on and involvement with academia and the healthcare industry.

b. Consumers

Analysis of consumer focus groups revealed a more pragmatic definition of HI. This purportedly gained from theory and practice obtained during their education and after joining the workforce.

> *Actually, health informatics deals more with the application of technology in healthcare to help clinicians, managers and governments to deal with healthcare management, data management and policy review and design – those kinds of things. If you marry technology with the use of health data then that is my understanding of 'health informatics'. (Participant 1, Alumni FG 2)*

The original perception implied HI was more the property of information technology than health sciences, thus explaining why most healthcare professionals were not prepared for or knowledgeable of informatics and its application to their specific areas of responsibility. Participants perceived HI as a new field, resulting in stakeholders' poor understanding of roles and responsibilities.

Consumers' initial definition suggested informatics was essentially another term for health information systems. Unlike provider groups, however, they were quick to suggest 'there was much more to it than this' but at first, unable to vocalize exactly 'what'. Findings initially portrayed a convincing and credible, if somewhat modest understanding of HI and its impact on the healthcare industry.

> *Health informatics is the concept that links information to technology to communication. (Participant 2, Student FG 2)*

4.1.1.2 Communicating Preparedness for Health Informatics

Disparity in preparedness for HI was a key theme. Academia, government, nor healthcare knew 'what to do' with HI. This was attributed to the new and evolving nature of the science. The next theme explores how this topic was communicated amongst all stakeholders.

a. Providers

Poor communication was repeatedly cited as problematic, thus contributing to academic management's lack of preparedness and consequently that of students, graduates and faculty. All conceded communication was of key importance, yet few examples were identified of effective communication with key stakeholders. Providers admitted they had been both the recipient and instigator of poor communication.

HI had been communicated to providers, when they were students and subsequently as faculty, in varying degrees. This helped to explain why participants assigned disparate levels of importance to HI; interestingly, in many instances, the opposite was the case.

> *As a student, I hadn't ever heard the term "health informatics" right through to completion of my Masters in Nursing, which is rather odd now that I think about it. There has always been technology in nursing but the use of "nursing informatics" is relatively new and as we have already discussed the possibilities are limited only by imagination and budget! But as for my own expertise, I would say I have none! (Participant 3, Faculty FG 3)*

Embedded in these discussions was the issue of cultural implications. Accounts of failed projects involving informatics communication applications revealed significant cultural influences, a testimony to the status of faculty preparedness for informatics instruction.

> *Remember this is a collective society. They gain as much medical advice from the family elders as they do from modern medicine. Maybe it has something to do with that – their culture. (Participant 5, Academic Management FG 1)*

It was conceded cultural traditions and beliefs continue to have a strong hold on this young population, despite the apparently rapid evolution towards westernization. The primary concern was for culturally sensitive curriculum design in relation to HI.

> *You might be right. I think it's a cultural thing. The idea of sharing discussions about personal or family 'weaknesses' such as cancer or autism or diabetes, for example, with strangers would not appeal to these students at all. It would simply not happen in their world. Such 'weaknesses' or frailties are not discussed with even the closest of family friends. I bet they told you that no one would use it! (Participant 1, Academic Management FG 1)*

This discourse concluded by summarizing the need to be cognizant of cultural beliefs when preparing for and communicating HI. It also served to inform or remind participants of the characteristics of the student population.

> *It's a reminder that in many ways they haven't changed too much at all. Any why would they? I think this is so interesting! I didn't realize that's how they viewed illness. (Participant 4, Academic Management FG 1)*

b. Consumers

Consumers attributed their lack of preparedness to navigate HI applications to the absence of communication between academia and industry. The outcome was an inability to learn, apply theory, or assimilate knowledge.

Consumers asserted that many key stakeholders were not well prepared to discuss, utilize or implement HI, attributing this to inadequate, insufficient, ineffective communication. Analysis emphasized the claim academia was not preparing graduates with informatics knowledge and competencies seen as basic requirements by industry. Academia was admonished by one alumni participant to "Ask the question!"

> *It would be great if someone would come and see what we need or someone would give us a place where we could put our suggestions of what we need in their graduates. (Participant 1, Alumni FG 2)*

Some students admitted they received no HI theory and first learned of this concept at regional and international conferences. Others were introduced to the topic during practicums; only a few reported receiving HI education at college. In spite of this, there was consensus HI was important, relevant, even essential, to them as a student and as a new healthcare professional.

> *Health informatics is a technology that is evolving quickly. It links information to technology and communication to healthcare. And, I think the communication aspect is the most important and is perhaps the thing that strikes me as so valuable; that we can connect families who live out in the country to their doctors in the city or even in another country. (Participant 3, Student FG 1)*

Inclusion of 'family' and the collective nature implied in this definition was noteworthy. Students verbalized understanding of this concept at an earlier stage and in more appropriate detail than any other participant group.

Consumers concluded that graduates were equipped with HI skills that did not align with professional roles and responsibilities, if indeed they were equipped with any informatics skills at all. This was ascribed to substandard communication, varying degrees of HI knowledge and competencies held by faculty. Participants articulated the urgent need to remedy this situation.

> *It seems to me that we have the experts and we have the systems, both 'live' and 'test' that students could work with, but there is no planning done. No communication takes place between all of the players. I can't point one out because I think the college and the hospital and the government all share in this. But it has to be fixed. (Participant 2, Alumni FG 2)*

Alumni and students intuitively envisioned the concept of communication using informatics and the resultant improved health outcomes. Cultural implications and hesitancy to adopt communication applications were readily recognized. Consumers discussed how resistance to use could be overcome by providing examples to inform their families, thus gaining trust. In some cases, this had already been accomplished, refuting provider discussions suggesting communication applications would not work due to the collective nature of the culture.

> *Well, for example, with my Father. He goes to Thailand for treatment of his cardiac problems. They have done surgery and he's fine now. Five years ago he would be going every 3 months to Bangkok for consultations, but now they Skype! (Participant 1, Student FG 4)*

An interesting sub-theme was the allegation that 'Nationals' (a term referring to the indigenous population) did not trust their own health system. It was purported as common knowledge this population preferred to travel abroad to Asia, Europe even North America to obtain healthcare.

> *Either the college, hospitals or government, or maybe all of them, need to create a program where the healthcare professionals here, along with the patient and the family, can meet with the doctors and nurses who cared for the patient in Germany or the UK or Thailand, or wherever. We all know that people here prefer to travel to these places for their healthcare. But, health informatics, especially the communication tools, could be used to reduce the need to travel. And, the doctors here could consult with the doctors in those other countries and help each other, teach each other. (Participant 4, Alumni FG 1)*

This suggested a shift from the conservative, traditional culture to comparatively more liberal beliefs of the western world. Consumers witnessed a broader acceptance of informatics communication tools as families began to meet virtually with the healthcare team abroad.

Consumers asserted the need to take the lead, to gain knowledge of specific diseases through social media support groups, and in turn assist and support the family.

> *Another application is where you can use social media to connect with other patients who have the same condition. Our teacher discussed this with us and showed us an app that could be used to create this network. I really liked the idea but some of the other students didn't want to work on that project. They didn't think anyone would use it. But my brother is autistic and I know, even if my parents wouldn't want to use this support group, I sure would. (Participant 1, Student FG 3)*

Analysis suggested communication had assumed a new persona, one most consumers were ready to employ.

4.1.1.3 Barriers to Communication

Ineffectual communication had become a prevalent theme in all focus groups. The need to identify obstacles was explored.

a. Providers

The topic of communication prompted ardent discussions and was often cited as contributing to the substandard state of curriculum, resources, practicums, graduate competencies and stakeholder relationships. Further, it was implied the inability to communicate was due to a lack of support. It was implicitly accepted that communication was ineffective, inefficient and at times non-existent. Notably, there was evidence providers were receiving similar treatment from their superiors.

> *There have been no discussions involving health informatics at any divisional academic or senior academic management team meetings to date. I don't even know what Academic Council's plans are for Health Sciences, or health informatics, resources, or any of this. They never discuss this with us, but I'll find out. (Participant 1, Academic Management FG 1)*

The need to identify specific causes contributing to these barriers in communication was not explicitly articulated in any provider focus group. Conversely, the discussions were directed towards remedial actions.

b. Consumers

The key concern was a lack of awareness of health science programs and inherent needs and capabilities of each. This claim was levied not only at industry and government, but the college itself. This was attributed to ineffective communication.

> *Communication between industry and academia needs to improve; someone just needs to ask the question! (Participant 1, Alumni FG 2)*

Interestingly, HI communication within and amongst industry partners was also seen as problematic and ineffectual. Alumni assessed the implementation and acceptance of HI improved notably if communicated by a professional peer.

> *The health informatics expert at our hospital is a physician. Once he was hired, communications to the medical community improved right away. Physicians listen better to another physician talking to them about IT. (Participant 5, Alumni FG 1)*

4.1.2 Future Plans to Improve Communication

Remedial plans were offered from provider and consumer perspectives. Both groups concurred communication was essential in developing and sustaining relevant HI curriculum.

a. Providers

Plans were made to initiate dialogue. HI would become a standard agenda item. A more team-oriented framework would be adopted involving faculty and industry.

> *I remember when Health Science faculty met with industry partners for a half-day workshop. These were so beneficial and I'm not sure why we stopped having them. (Participant 4, Academic Management FG 1)*

Participants agreed accreditation requirements should be reviewed, benchmarking opportunities investigated, and stakeholders surveyed to determine perception and needs.

> *Maybe we should be paying some attention to this, especially as we're looking at accreditation next year. If informatics is something used by all professions, then I think we better be sure to include it in our curriculum. (Participant 2, Faculty FG 1)*

With responsibility accepted, providers exhibited renewed commitment to lead and manage programs, liaising with all constituents. The shift to a more generative organisational culture where information was shared and tasks delegated was now recognized as the preferred strategy.

The resultant impact on curriculum design and procurement of resources was accepted. At the conclusion, however, a concerted effort to move forward as a ‘management team’ became obvious without attributing blame. The need to improve communication was identified as the critical first step in effecting change. Empowered by this renewed sense of direction, professionalism, teamwork and autonomy, conversations were notably more positive. Plans to liaise with best practice within this and other academic settings had instilled a clear vision of academic responsibility.

b. Consumers

The need to raise awareness and align industry need with curriculum was seen as critical, suggesting this would succeed only if dialogue began at the corporate level. Consumer plans were pragmatic and simple yet represented untold potential.

> *So, it was fairly easy to convince senior management to talk with *College about the pharmacy program, because they know what a pharmacist does. But nobody knows what a health informatics person does and they think any person with a high school certificate who can use a computer is a good candidate. (Participant 1, Alumni FG 2)*

Academia was providing “unnecessary, useless, out-dated curriculum” and industry was allegedly hosting ineffective, unorganised and non-productive practicums. Consumers rationalized, as this was a new development in healthcare, neither partner understood HI, its salient purpose, or where to assign roles and responsibilities. Again, no one had “asked the question”.

Plans to inform and educate gained momentum, indicating, as new healthcare professionals, they could no longer accept or tolerate the current status, claiming it was unfair to students, families, the community and ultimately the country.

> *You’re right when you say that money shouldn’t be a problem. But then, what is the problem? We need to get everyone in the same room and talk! What do they know? What do they*

> *understand? What do they need / want from the college and what does the college need / want from them? (Participant 2, Student FG 1)*

Interestingly, consumers willingly accepted responsibility, admitting they should have informed faculty and academic management long ago.

4.1.3 Communication within Focus Groups – A Catalyst for Understanding

The focus group forum enabled participants to share personal beliefs and knowledge of informatics purpose and role. This exchange resulted in enhanced understanding.

a. Providers

Gradual awakening to the potential of HI was evident through all provider focus groups, resulting in new or renewed interest. It was also apparent their definition of HI had acquired more detail and dimension.

> *In terms of health informatics, what comes to mind is technology that enables healthcare professionals (and no matter what technology that is) to provide access to information in support of decision-making…to try and work out what 'best practice' is. (Participant 2, Faculty FG 2)*

Analysis further revealed serious communication problems existed on many levels: throughout academia, between academia and industry partners, with accrediting agencies and with government. Discussions concluded with renewed commitment to address the situation.

> *Health Information Management and Healthcare Leadership programs have just been accredited. I'll share their report with everyone so you can see what surveyors were looking for and what they had to say about our health informatics efforts. (Participant 3, Academic Management FG 1)*

It was unclear why the opportunity to share this information had not occurred directly on receipt of the accreditation report. This was, however, one example of the way in which the focus group acted as a catalyst for communication.

Initial analysis suggested ignorance of the relevance of HI in academia. However, pursuant to shared insights, a correlation emerged between informatics and salient health professions' roles and responsibilities. Interestingly, two key stakeholders; patients and families, had not yet been identified. This was soon to change, as discussions exhibited a broader, more pragmatic understanding of HI.

> *In Med. Lab. we have always used technology but in a sort of isolated fashion. But, this system and informatics is much more than this, I think. We could use it for monitoring the patient, educating the patient…really tailoring the care of the patient's needs. (Participant 3, Faculty FG 2)*

b. Consumers

Encouraged by new alliances and shared insights, consumers made plans to collect information from stakeholders, beginning with students. This information would be presented to academia, industry and government. Improving stakeholder communication was critical, convinced only when this was accomplished could any sustainable enhancements be designed and implemented. Consumers would present their programs highlighting current and future needs; industry partners would be asked to do the same.

> *I would like to know more about how it actually works, how to actually use it. I think there are a lot of possibilities and we should be looking into this more, both the student and our teachers. Some of the responsibility is mine to learn more. I've enjoyed discussing this with you and I'm going to tell my class and my teacher about the projects we've discussed. (Participant 5, Student FG 1)*

4.1.4 Similarities and Differences

4.1.4.1 Similarities Between Groups

Initial uncertainty about HI was common to both groups but was generally defined as a health information system, database, electronic health record or simply technology in healthcare. However, providers and consumers concluded by demonstrating an enhanced understanding of HI within the context of their profession and program in academia.

All participants noted HI has had or will have a significant impact on all healthcare professionals and the industry as a whole. A common notion was that cultural issues were responsible for resistance to acceptance of HI in practice and in academia.

4.1.4.2 Differences Between Groups

It was agreed curriculum required review. Consumer discussions represented thoughtful, detailed, contextualized planning. Conversely, analysis of provider discussions suggested this was a new concept to many; planning appeared to be more ‘crisis management’ than practical and sustainable. Consumers identified the need to involve industry partners early in discussions, describing this as critical and urgent. Providers became aware of this only as a result of focus groups, not immediately identifying this as an urgent need.

4.2 Confidence

This research explored how well academia prepared the next generation of healthcare professionals in application of HI. Accordingly, it was important to gain an understanding of provider and consumer knowledge of the subject.

4.2.1 Confidence in Expressing Knowledge of Health Informatics

Confidence in perceptions and comprehension varied, as did the ability to relate HI to their salient program and profession. As focus groups progressed, ideas and opinions converged, thus impacting participant confidence.

a. Providers

Discussions relating to HI knowledge assumed two dimensions: academic and professional need for informatics knowledge. Analysis suggested varying degrees of informatics knowledge existed amongst management and faculty. Some had the benefit of formal informatics tuition while others reportedly had none. Some faculty had therefore allotted academic responsibility to those with any previous knowledge.

> *As faculty, it doesn't really involve me and I don't teach anything about health informatics or about the health information system that students use. It's not my area of expertise and I gave it a miss. (Participant 1, Faculty FG 3)*

Others had taken the initiative to learn then share this knowledge with students, regardless of its inclusion in that program's matrix. Providers acknowledged a diverse range of exposure to the topic as a student, a healthcare professional and as an academic.

> *I'm really not very familiar with health informatics and all that it encompasses. We did learn how to collect data and create a database, but only from an IT aspect. No theory or other discussion about health informatics at all. (Participant 5, Academic Management FG 1)*

Some participants recounted initiatives taken to maintain their professional development in this field. Most providers, however, admitted to a somewhat superficial knowledge, having made no attempt to advance this through personal professional development.

Analysis revealed increasingly confident discussions of HI during the focus groups. Eventually all contributed to the conversation, suggesting how informatics interfaced with their profession, sharing their vision of how this could/should integrate with academia. Ultimately, providers resolved to resume professional and academic responsibility.

Discussions informed and educated the participants resulting in a clearer perspective of the need to ensure all faculty and students acquired the requisite knowledge of HI.

> *Every graduate from Health Science programs should have the knowledge and skills to use health informatics applications, however this may apply to their specific profession. And, our faculty must get some exposure to health informatics as it relates to their program, too. (Participant 1, Academic Management FG 1)*

The last dimension in discussions of knowledge focused on the needs of healthcare professionals, including alumni. In the beginning, some had 'just not thought about it' perhaps assuming a similar strategy to the faculty who decided to 'give it a miss'. However, providers now turned their attention to requirements of internal and external stakeholders.

Initially, providers demonstrated limited comprehension of informatics purpose, application or potential. At the conclusion of discussions, however, participants articulated many purposes of HI and the urgent need to ensure inclusion in all curriculums.

> *Health informatics connects all hospital departments so that all clinical and non-clinical health professionals can enter information, view comments and results that others have made about the same patient. But, this information must be shared not only with the physicians and other care providers, but also with the patient and family. This really impacts patient education and patient compliance. (Participant 3, Academic Management FG 1)*

This realization of the multifaceted role of HI also served to inform participants of their responsibility to academia. Specifically, this entailed provision of requisite educational and experiential learning opportunities to all health science students and faculty.

It became evident some participants had assumed the role of *champion* or *expert,* regardless if from a clinical or non-clinical background. C*hampions* introduced examples of applications, which informed, taught, and reinforced colleagues' comprehension, prompting enthusiasm to research the topic and improve knowledge and competencies.

> *Including health informatics curriculum will facilitate the assimilation of knowledge from all other courses. (Participant 2, Faculty FG 2)*

b. Consumers

Analysis implied consumers had a sound understanding of HI, its evolution in healthcare and what was needed to proceed. Further scrutiny indicated this dialogue was based on knowledge and experience gained in the workforce. This group seemed keen to demonstrate their command of HI.

> *There is not a pure understanding of the profession, or of the science of health informatics. (Participant 2, Alumni FG 1)*

It was suggested that as HI was new to the healthcare industry most stakeholders did not understand salient applications.

> *They don't know what health informatics is. It's quite new and quite exciting. They don't know that health informatics can make a big difference to their quality and budget. (Participant 1, Student FG 2)*

Consumer participants appeared to be confusing their level of knowledge with their level of competency. Participants who received HI tuition as a student claimed this was primarily theory with little opportunity for practical, experiential learning given.

> *We had lots of classes in college, where we talked about this system but it only started to make sense to me after I used it. I found this very interesting and thought, then, that there would be lots of ways to use this. (Participant 1, Alumni FG 2)*

It was notable that lack of HI curriculum had not deterred their interest as a student or as a new healthcare professional. Regardless of the amount of tuition received, participants were aware of the need for informatics knowledge and of their need/desire to acquire more knowledge.

> *It has been called the 'growth industry of healthcare' so we need to learn as much about it as possible. (Participant 4, Student FG 1)*

While consumers displayed a range in informatics knowledge, this discrepancy did not seem to be associated with tuition. Participants from the Nursing program, while having no informatics curriculum, adeptly discussed the topic suggesting an in-depth knowledge. This was attributed to a nursing instructor having instilled a keen interest.

> *It isn't in Nursing curriculum, but I know how to use *Health Information System. This is because of our training week. I felt very confident and was able to get to work and really be part of the team on the nursing unit. It wasn't so embarrassing then. (Participant 4, Student FG 4)*

Consumers acquired knowledge from a variety of settings: the college, hospital, conferences and Internet. In college, integrated projects were touted as being most beneficial in fostering an understanding of theory.

Participants admitted to an unacceptable level of knowledge, but were well aware of industry's expectations of them as a student and graduate to have at least basic competencies in informatics applications. Neither situation was acceptable for themselves or their colleagues.

> *Even though we haven't had any classes here at the college, we're expected to know what it means when we go to the hospitals on placement! We definitely need to learn more about this! (Participant 2, Student FG 1)*

4.2.2 Confidence in Preparedness and Competencies

Investigating preparedness for HI in academia was a primary goal of this research. Analysis demonstrated emerging degrees of confidence in knowledge and skills. Participants were invited to describe their competencies pertaining to HI applications. This would provide valuable information when assessing HI preparedness.

a. Providers

Most providers assessed themselves as incompetent with HI theory or application, yet voiced an understanding of relevance to their profession and healthcare. Participants from a nonclinical background assumed the lead in discussions relating to competency. This group previously claimed to have had HI theory during their University education.

> *To me, health informatics is at the very core of every healthcare profession. There isn't one career path that doesn't involve health informatics or some aspect of it. (Participant 3, Academic Management FG 1)*

Interestingly, participants from a clinical background demonstrated less confidence in their understanding of HI and its application.

> *In Medical Laboratory I've had lots of exposure to technology but I'm not sure if it could be labelled 'health informatics' or not. Of course, all lab equipment is a form of technology, but connecting the equipment to a system that collects the test results, allows us to monitor patient outcomes and staff proficiency…well, I hadn't thought about this as informatics. (Participant 5, Academic Management FG 1)*

It is noteworthy that all providers had earlier equated HI with health information systems. This fact might suggest, while they were well versed in the use of these information systems, their perception of broader applications of informatics was quite limited.

When attention was turned to student competencies, disparate opinions were expressed. Some believed that students had the necessary, albeit basic, skills in HI on graduation, suggesting they had fulfilled their academic duty. Others contended the college was not equipping students with requisite competencies, a situation described as "extremely sad and depressing".

> *In the last 2 years that I've been here I've been wondering and am still wondering how are we able to teach electronic health systems and health informatics to future healthcare*

> *professionals without actually having the practical part that they would learn the most from. (Participant 2, Faculty FG 2)*

The assessment of diverse student competencies could possibly be associated with the varying levels of faculty comprehension and competency. All acknowledged the need to become proficient in HI.

> *As educators, when we're admitting that yes, we are graduating students that cannot do the job, it says a lot about what needs to be done. The Health Science Department, as a whole, needs to be able to get our hands on the applications we need, the equipment we need and be able to get the students involved. I cannot continue to teach health informatics classes and hand out degrees without the student ever having touched a health information system. (Participant 2, Faculty FG 2)*

This impassioned plea met with unanimous agreement from both the professed informatics 'champion' and those admitting to a 'novice' level of knowledge and competency. Providers began to appreciate how informatics competency could augment teaching, making it more interesting and relevant for themselves and their students.

b. Consumers

Alumni were currently employed in various aspects of healthcare. Regardless of their career path, most admitted an inability to navigate requisite informatics applications on graduation, yet considered this a basic requirement of the position. A limited number felt they were well prepared to assume responsibilities in the workforce but later admitted extra and intensive training was required on all informatics applications, refuting original claims.

> *I understood the concept of the health information system and health informatics but I would have to say no, I wasn't well prepared for my first job – not at all. I needed a lot of training and support at first. (Participant 1, Alumni FG 1)*

The impression that academia produced graduates possessing irrelevant, unnecessary skills was repeated often. Again, this was attributed to poor communication with responsibility shared between academia, industry and government.

> *The college did start to include some health informatics but I don't think it was focused the way it should have been. They tried to introduce as much as they could into their education to make sure students are prepared for the work place but unless they are in touch with the work place, they wouldn't know what they needed to teach them. (Participant 1, Alumni FG 2)*

The inability to navigate requisite HI applications was also attributed to substandard experiential learning opportunities. Consumers understood the concept but could not use the applications.

> *When we went to the hospital placement, I realised I wasn't ready and there was a lot more the college could have done before sending me out. When we got there and were expected to know how to find a patient, enter results and write notes, we were lost and it was very uncomfortable. And, the staff was not too happy that we didn't know anything! (Participant 3, Student FG 4)*

Those students who reported confidence and competence in applying informatics also reported a positive practicum experience. Students attributed this to supportive preceptors and adequate access to relevant HI software.

Consumers were the only group to describe HI as an "emerging field" in healthcare and rationalized it was essential they acquire knowledge and skills to expedite future promotion.

> *I definitely need to learn more about this health informatics field. Firstly, we will be expected to know how to use *Health Information System when we graduate, that's a given. I'd never heard of it until the Lab Director told us during our orientation. We had to learn quickly and it was a rough start to our practicum. (Participant 4, Student FG 2)*

Analysis identified three key issues pertaining to training and acquisition of skill: (1) health science students required access to HI both at college and during practicum, (2) healthcare professionals were often either unwilling or unable to train or provide access to relevant informatics applications, and (3) there was keen awareness of the need to improve this situation for future students and graduates of all health science programs.

> *Somehow, some way they have to provide students with access to *Health Information system, or to some kind of system. I think this is important for every program at the college; everyone working in healthcare needs to know how to use it but we aren't given much of a chance to learn and train. It's not fair to the student! Or, to the hospital! (Participant 3, Alumni FG 1)*

Access to HI software in college and during practicums determined the degree of assimilation of knowledge and hence, competency. Analysis revealed an acute awareness of their insufficient proficiency, concluding they were left in a rather compromised state.

> *We had to learn how to use *Health Information System on the run. It was confusing and we hated it! (Participant 1, Student FG 2)*

4.2.3 Future Plans to Improve Preparedness and Competencies

As a result of shared beliefs and understanding, participants became aware of the need to advance the knowledge and application of HI amongst all stakeholders. Discussions of strategic and operational planning ensued.

a. Providers

Provider's initial recommendation involved curriculum review to ensure provision of relevant education in compliance with accreditation requirements. Academic management and faculty now concluded they had been working too long in isolation. Ineffective communication was tagged as the causative agent. Accordingly, plans for routine meetings with all stakeholders, having informatics as a permanent agenda item, were identified. A list of recommendations was generated: create opportunities to improve faculty knowledge, secure appropriate resources, design and deliver informatics professional development sessions to all interested stakeholders.

A certificate or diploma would be given on completion. These recommendations were seen as a means of ensuring fulfilment of academic and professional responsibility, improving student recruitment and faculty retention. An added outcome was the potential to generate revenue and lastly, to improve/sustain their reputation in the community as a ‘Centre of Excellence’.

Providers patently felt the need to improve relationships with all stakeholders. As a result of focus groups, participants began to perceive alumni as a valued asset. Consequently, suggestions were made to involve alumni in training faculty and students in the use of HI applications.

The need to provide access to relevant applications became paramount. Participants either volunteered or were tasked with the job of exploring possibilities of garnering informatics training for faculty at hospital or vendor locations.

> *Just to reiterate that this is quite crucial, that students are given adequate training. And, a collaborative approach is quite likely the most feasible, from our standpoint anyway. This will require some discussion with the Academic Council as well as the Industry Advisory Committee. (Participant 1, Academic Management FG 1)*

b. Consumers

Consumers identified one key recommendation. All graduates required detailed HI knowledge and competencies. Accordingly, consumers recommended academia engage more often and more effectively with stakeholders with the goal of closing this gap.

Consumers asserted both academia and industry found informatics complex. Therefore, it was suggested advocates or champions be identified and given the responsibility of educating, training and supporting end-users.

> *There has to be someone who understands the need for it to convince both parties of the need for it. Even at the workplace, at all levels, there are some who still don't see the need for or understand informatics. So, they really need advocates. (Participant 5, Alumni FG 1)*

Further recommendations were made to share existing informatics resources, expanding this to include faculty.

> *If students in all programs could have access to their particular modules it would really help them. And, in turn it would help us, as their employer. So, I created a training program for students when they come for their practicum. I think this would benefit their teachers too. (Participant 3, Alumni FG 1)*

Many recommendations were discussed including workshops and informatics information sessions for all stakeholders of health: healthcare professionals, health educators, government and the community. The foresight discussed and demonstrated by these participants was remarkable; responsibility to lead this change was implicitly assumed.

Discussions suggested a perceived lack of trust in the national healthcare system coupled with a preference to travel abroad for all healthcare needs. Consumers contended this was common knowledge in the region. Accordingly, alumni and students recommended informatics projects, which would facilitate this practice safely and economically. Plans included development of an international integrated health information system connecting local facilities with the more popular global centres, particularly those in the United Kingdom and Germany.

Complementary to this would be the implementation of communication applications connecting patients and family with their international caregivers. The rationale behind this was two-fold: it would improve patient health outcomes and would preclude the need to travel abroad for follow-up care. This concept would be presented to academia and the health sector in the hope of garnering interest and support.

> *It’s not just about creating an integrated system with this hospital in the UK, which is totally possible because the system is web-based, but also creating sessions where the patient and family meet with the UK doctor after they have been discharged and return home. The *country doctor could also be there and they could compare notes. The doctors would benefit as well as the patient and family. (Participant 4, Student FG 1)*

Focus groups resulted in enthusiasm to engender change. This was most notable amongst Alumni. These young professionals were eager to help students, family and community. In the alleged absence of “complete, current and relevant tuition” this group had gained an insight and level of knowledge that was difficult to comprehend or explain.

4.2.4 Similarities and Differences

4.2.4.1 Similarities Between Groups

All participants agreed that HI knowledge and competencies were important for health science students, graduates and faculty, conceding such omission posed a serious problem. Similarly, all conceded most faculty was neither confident nor competent teaching HI concepts. Analysis concluded industry was unprepared for HI. This was attributed to a lack of understanding, the belief this was a new field in healthcare and ultimately that decisions determining where HI belonged had not yet been agreed upon.

4.2.4.2 Differences Between Groups

Analysis suggested a degree of complacency amongst providers regarding the need for informatics curriculum, resources, training and support. Alternatively, consumers articulated a contextualized understanding of the current situation, identifying gaps and offering solutions.

Data suggested most providers had not remained current with professional development. Many admitted an inability to navigate anything more complex than a database containing demographic data. Conversely, consumers were able to discuss HI in contextual detail, regardless of having had any tuition. Consumers were cognizant of their professional roles, responsibilities and requirements pertaining to informatics applications. This theme was less pronounced amongst providers.

Consumers perceived HI as the “current trend in healthcare” although this was not evident in data from providers groups. Providers admitted to very minimal understanding of and/or interest in HI. Most consumers discussed informatics applications in exhaustive detail. Some providers intimated HI was the responsibility of the Health Information Management profession and Health Management faculty. Consumers strongly disagreed, stating that HI overlapped many professions and was not the sole property of one profession.

4.3 Responsibility

Providing complete and relevant education was seen as collaboration between the academic, health and government sectors. Analysis suggested informatics curriculum was viewed as neither ‘complete’ nor ‘relevant’. The need to determine responsibility became a common theme in all focus groups.

4.3.1 Current Perception of Responsibility

Participants discussed the topic of responsibility from two perspectives: (a) academia’s responsibility to educate and (b) the responsibility of health and government sectors to provide sustainable HI applications. Elements of personal and professional responsibility were also discussed.

a. Providers

Providers conceded it was their responsibility, both as academics and health professionals, to provide complete, relevant education. Informatics in curriculum was visibly deficient. Access to HI resources was also notably lacking, specifically access to health information systems, previously considered fundamental.

> *I agree that it is a shared responsibility. I realize we have a commitment to our students to provide them with an education focused on best practice. However, I feel this is only achieved through the combined efforts of the healthcare industry and academia. (Participant 4, Faculty FG 3)*

In one focus group a faculty member informed the group such a 'system' had been given to the college from a vendor and was notably under-utilized.

> *Of course I agree with all that you have discussed so far. But, it seems to me you're forgetting that we had an academic module of the *Health Information System given to us 7 years ago! We had the very system that we're talking about here…given to us. It was worth a lot of money, and if I recall, only a couple of programs used the system as part of their curriculum. (Participant 2, Academic Management FG 1)*

A debate ensued which was both informative and revealing. Relationships and alliances within the providers group were exposed, adding a new complexity and dimension to discussions.

> *Health Information Management and Leadership programs used it, but none of the clinical programs seemed interested in using it. I shouldn't really reflect on their 'interest', but as Associate Dean I recall discussing this at Divisional Academic Team meetings but could never seem to generate any interest. (Participant 2, Academic Management FG 1)*

Analysis identified no demonstrable acceptance of responsibility for this situation, only a conviction to assign accountability. This hesitancy to assume responsibility might be indicative of the groups' actual understanding, knowledge and acceptance of HI. It is noteworthy this conversation occurred early in the session. Attitudes, perceptions and acceptance of academic responsibility were re-evaluated and transformed as a result of the focus group.

> *Well, I think that's just what we've been talking about and I'm hearing two sides! The Nursing program has been able to get the hospitals to assume responsibility for training our students on their health information system. What the legal and ethical issues are, I'm not sure, but it's a great idea. On the other hand, I agree with the statements that we, as educators in the health sciences, must assume some of the responsibility for training our students. (Participant 1, Academic Management FG 1)*

Initially, providers claimed they were not HI experts; therefore, it was not their responsibility. The compromise was to "give it a miss". By the conclusion, attitudes had changed.

b. Consumers

Analysis indicated HI overlapped several existing healthcare professions, which might explain the sense of confusion and resultant variation in academic and career path developed and taken. In line with this was the suggestion that the healthcare industry did not know whom to assign HI responsibilities.

Consumers proffered a simple conclusion. College students required HI training and the health sector had the expertise and resources to train them. Yet this simple transaction had not taken place. Many attributed this to academia's inability to determine industry need.

> *[Academia] is looking at it from a different perspective than a person in the real workforce. When you're there and you are implementing systems, you are looking at it differently than when you are teaching it. What we really wish would happen is that someone would come and see what we need, to understand what the market needs. Ask the question! (Participant 1, Alumni FG 2)*

Alumni suggested HI professionals bridged the gap between information technology (IT) and healthcare professional groups; therefore, responsibility was collaboration.

> *IT is responsible for the health informatics framework; healthcare professionals are responsible for building on this framework – a team effort. (Participant 1, Alumni FG 2)*

Interestingly, consumers acknowledged they were “responsible for our own learning” and should take some initiative regarding HI as it pertained to their program and profession.

> *We can’t always leave everything up to the teachers! If we don’t do something about it who will? It’s our responsibility too. (Participant 4, Student FG 1)*

Consumers claimed it was the joint responsibility of all stakeholders of health education, from the highest ministerial level, to provide complete, relevant knowledge and competencies to students.

> *We are all responsible in some way for the health of the country and so should work together. Staff and equipment are expensive so we have to learn to share. (Participant 1, Student FG 4)*

4.3.2 Accountability for Responsibility

Knowledge and perception of purpose evolved. Participants sought to clarify who should be responsible for HI in many arenas: academia, government, health and self.

4.3.2.1 Governance

The theme of governance, ethics, and accreditation were embedded in discussions of responsibility and curriculum. Analysis suggested that without governmental leadership and policy, responsibility for HI was neither assigned nor taken.

a. Providers

Discussions related to governance in two key areas: (a) academia’s accountability to government and accrediting bodies and (b) academia’s duty to students. The revelation that few program’s curriculum complied with ministry or accreditation statutes/standards prompted implicit reflection. Noncompliance served to contextualize the quality of tuition on offer. Accordingly, remedial actions were discussed and assigned, including review of curriculum and accreditation standards. Providers admitted the future path was unclear and meetings with academic council would be arranged to secure their guidance.

The second prevalent theme addressed academia's duty to students. Even those who had included some level of HI tuition admitted components relating to ethics and governance had been omitted. This was in direct conflict with knowledge that national and regional health authorities had established HI departments.

> *The Health Authority has had Health Informatics departments for some time now and is always looking at ways to incorporate health informatics. (Participant 3, Academic Management FG 1)*

Governance of HI was seen as complex. Gaining an appreciation of how appropriate health care might be delivered, assessed and reimbursed on a global basis with a virtual partner was identified as the new reality in industry. It was conceded that students required knowledge of policies governing HI. This was acknowledged to be another weakness in curriculum.

> *Is he/she paid for this service or is this gratis? Who monitors the advice given by the healthcare professional? How is quality monitored and assured? There need to be polices to govern this whole aspect of health informatics and this is an area that is a little weak, if not completing missing from content altogether. (Participant 2, Faculty FG 2)*

Participants expressed awareness of the importance of informatics governance, and made plans to determine current local practice that could advise curriculum design. It is noteworthy the extent of investigation was to the 'local' level only; investigation of international policies was not identified.

b. Consumers

Few could recollect any discussion of informatics policy in curriculum; however, all were now aware of the importance this had in their workplace. Alumni, having participated in an international hospital accreditation, had the opportunity to assess the informatics gap between academia and industry. This experience produced a list of recommended future plans concerning HI governance.

> *We were told by the *Accreditation Council there should be policies about the electronic health record and how it is integrated within the hospital departments and then between all the hospitals in the region. (Participant 2, Alumni FG 2)*

It was conceded HI policy was of key importance and must be included in curriculum. It was the shared duty of academia, government and industry to ensure healthcare professionals were given the requisite education and training in informatics governance.

> *The accreditors noted there was no standard practice between facilities in our health network about how the *health information systems were being designed, implemented, used, security issues … many things. (Participant 2, Alumni FG 2)*

Analysis revealed an extensive scope of need. Consumers contended neither clinicians nor management had acceptable working knowledge of HI policy. Interestingly, there was knowledge of an informatics policy manual, which had been in existence for some time. Analysis suggested this information had again not been shared with the appropriate stakeholders.

> *We have set up a committee that has representatives from each hospital and we are going through their practices and then looking at policies, if there are any. (Participant 1, Alumni FG 1)*

Plans advanced involving collaboration of academia and government. These included establishment of programs to train hospital staff in informatics utilizing students, alumni and management as project leads. Consumers revealed a mindfulness of the importance to include all participants in future plans relating to HI governance.

Consumers agreed it was necessary to study informatics security regulations suggesting this would facilitate patient and family acceptance. This discussion demonstrated an understanding of cultural implications and an insight into the current status of informatics.

Consumers asserted hospitals were hesitant to allow students access to HI applications because there were no written policies and procedures to direct them.

> *Hospitals are slow to let us use their systems because there are no rules and no written guidelines for the staff to follow with us. They need to create policies. (Participant 1, Student FG 2)*

Participants alleged hospital staff did not have working knowledge of HI policies and governance. Accordingly, there was an urgent need to inform and involve hospital staff in the design, implementation and maintenance of policy, to ensure effectiveness and compliance.

> *We take management and policy design and ethics. I think we could be very useful to them with the design and implementation of this new system. (Participant 4, Student FG 1)*

As discussions concluded it became evident consumers were cognizant of the risks involved with operationalizing HI applications in the absence of policy. It was concluded use of informatics applications in this environment was unsustainable.

4.3.3 Future Plans to Ensure Appropriate Responsibility

a. Providers

As discussions progressed, analysis revealed a new, contextualized understanding of responsibility. It was conceded collaboration between academia and industry would provide requisite knowledge and competencies required by and acceptable to all stakeholders.

> *In fact, in our Industry Advisory Committee meetings they say it isn’t their responsibility, that the student should know how to*

*manoeuvre through *Health Information System before they leave the college. (Participant 4, Faculty FG)*

Providers implicitly assumed responsibility for the current status of their programs while allotting some to the governing body of the academic institution.

My first recommendation would be to meet with Academic Council and discuss this with the Chancellor and Vice-Chancellor. Because this impacts all health science programs, it must be taken to that level. I need their advice and direction. (Participant 1, Academic Management FG 1)

Providers had admitted earlier to 'complacency' and willingness to 'teach to the matrix' without taking time to explore other resources. Some confessed they previously had no interest in or knowledge of HI applications. Through shared insights came the realization there was no need to continue working in silos. Alliances were formed, tasked with initiating conversations with stakeholders, researching affordable resources, performing literature reviews to improve knowledge of best practice and more. Participants were reminded it was their responsibility to take initiative and become innovative.

As expected, clinical and nonclinical health professionals viewed HI from different vantage points. This dialogue now served to remind participants of professional and academic responsibility, to students and to themselves. Perceived 'experts' offered to share resources, develop integrated projects and collaborate with peers to review curriculum, accreditation requirements and industry need, all with the view to improve and subsequently transfer this new knowledge.

b. Consumers

These future healthcare professionals were now aware most aspects of health care and service included some element of HI. Consumers conceded the majority of their informatics learning occurred after graduation.

> *Health management graduates, and maybe all Health Science graduates, need to know these things. How can we support decision-making? But, after 4 years in college, I never heard health informatics mentioned once. That's just unacceptable. (Participant 1, Alumni FG 2)*

Consumers acknowledged it was essential to assess stakeholder need. Stakeholders were identified as fellow students, faculty, industry and government. Including students was seen as imperative, suggesting it was inconceivable this had not occurred to those responsible for curriculum design. This process would result in relevant, interesting content enriching both teaching and learning.

> *Academics, as much as they try, still don't have the feel for the real-life market. They would try to introduce as much as they could in their teaching, but unless they are in touch with industry, they wouldn't know what they needed to teach. (Participant 2, Alumni FG 2)*

Access to HI applications was seen as a fundamental. Improved access to and utilization of resources required planning and must include all stakeholders. Academia and industry must discuss their respective needs and resources to ensure academia no longer produced "un-needed graduates".

> *If students in all programs could have access to their particular modules it would really help them and, in turn, it would help us as their employer. Neither the college nor the hospitals were good at providing that when I was a student. (Participant 1, Alumni FG 1)*

A notable finding involved the virtual HI laboratory. Alumni were members of an international project team responsible for design and development. This team was also tasked with designing a global HI matrix. Interestingly, one member of academic management knew of this project, yet made no mention of this global HI curriculum. It is unclear why this information had not been shared.

> *Basically, there is a lot of confusion about health informatics as it overlaps and interacts with three or four different disciplines. I've just met with *International Informatics Association and what we are doing is developing some*

> *curricula for global use. It is important for people in those fields to understand the differences and commonalities so they can use health informatics to their advantage. It would be good if there were some teachers from here on this project too. (Participant 1, Alumni FG 2)*

4.3.4 Similarities and Differences

4.3.4.1 Similarities Between Groups

Providers had been reminded of academic and professional responsibility to acquire HI knowledge and skills. Consumers appeared well aware of this, yet demonstrated understanding of and tolerance for the current state of their tuition.

Many participants noted an unacceptable level of support from the healthcare industry. Consumers suggested this was due to a lack of policy directing hospitals in their responsibility to students. Providers similarly stated this concern but offered no evidence nor explanation.

Focus groups agreed health science students received an inappropriate level of HI education. Plans were made to improve this by benchmarking, reviewing accreditation requirements, performing needs assessments of all stakeholders.

There was consensus practicums required improved planning to ensure students were given access to HI applications, allowed to perform relevant duties and to complete appropriate projects and research. Planning, communication and awareness of student competencies were cited as areas needing further explanation amongst stakeholders.

All agreed HI resources were required. Plans were made to investigate the possibility of incorporating HI training in all programs.

4.3.4.2 Differences Between Groups

Analysis revealed consumers innately described plans in detail suggesting pre-existing insight coupled with eagerness to affect change. Provider planning efforts initially appeared less focused.

Providers initially demonstrated a degree of complacency regarding the need for HI curriculum, resources, training and support. Consumers portrayed a more perceptive awareness, identifying where gaps existed and strategies required to resolve this.

Providers demonstrated a resistance to assuming responsibility to improve their HI knowledge, stating this was not their area of expertise and therefore not their responsibility. Consumers readily accepted responsibility while noting some also belonged to academia and external stakeholders. Consumers noted HI was not well understood by academia or industry, suggesting that this resulted in resistance to accept responsibility for HI in academia, industry and government.

There was agreement that lack of support from the healthcare industry was prevalent. Consumers suggested this was due to lack of policy and guidelines directing hospitals in their responsibility regarding health science student. Providers offered no elaboration. At the conclusion of all focus groups it was generally agreed that an inappropriate level of informatics education was currently provided to all health science students. Recommendations to resolve this were discussed in each participant group and will be addressed later in this summary.

4.4 Curriculum

Understanding the status of informatics curriculum was a key goal of the research. Participants were asked to discuss curriculum requirements from the perspective of teaching and learning.

4.4.1 Perceptions of the Status of Curriculum

a. Providers

Regard for HI curriculum ranged from, “It doesn’t really involve me” to “I refer to it in all courses I teach”. Analysis revealed an evolving perception that HI concepts had been included in teaching, but faculty simply had not referred to it in those terms. A degree of frustration was apparent in the knowledge that HI curriculum should be a basic element in all matrices, although participants knew this was not yet the case.

> *Students are looking at this as if they're looking at the Eiffel Tower in a picture. They're not able to deal with it because they don't have an understanding of what this technology does. This is extremely sad and depressing. (Participant 2, Faculty FG 2)*

The inconsistency of HI content in curriculum was attributed to many factors: lack of faculty knowledge, experience, support, resources, and time. However, as evidenced during all focus groups, this could not be contributed to lack of interest or willingness to change. As experiences were shared, novices were able to make the connection between use of technology and their specific profession and area of teaching.

> *I know there is no specific 'health informatics' curriculum in the Pharmacy program and after thinking about this and listening to this conversation, we're really not being very fair to our students. It's difficult enough to cover all the material as it is, but perhaps I need to learn a little more about it! (Participant 1, Faculty FG 3)*

The open format of the focus groups enabled participants to gain a clearer perspective of the situation.

> *It's not that I'm not interested in it as I can see great potential for the use of this in the field of pharmacy. I just don't have the time to explore this, or I haven't made the time! (Participant 1, Faculty FG 3)*

Such assertions resulted in much reflection as participants grappled with their newly gained awareness of and contribution to this situation. Sharing this confession was ultimately beneficial as this theme was repeated throughout the provider focus groups.

> *I'm not sure why I've left this to others as I realize now the students need to be competent in the use of health informatics, no matter where they work in the healthcare industry. But, that's the truth of it, I leave all discussions of technology, information systems – all things I think would fall*

> *under the term "health informatics" to others. (Participant 1, Faculty FG 2)*

Analysis revealed isolated instances of initiatives taken to include HI, recognizing the need to provide even a cursory level of tuition to their students, regardless if the subject was not part of the matrix.

> *It's been a slow start but in Nursing we are beginning to discuss informatics even though it's not on our matrix anywhere. (Participant 3, Faculty FG 3)*

A small group of participants was satisfied with the current quantity and quality of HI content. It is important to note these participants were all from a nonclinical background. They reported having had HI as part of their education and were of the opinion their teaching was both current and relevant.

> *I think the material we end up teaching, at least the courses that I've taught, are equivalent to what is taught in the United States. (Participant 1, Faculty FG 1)*

Pertinent to this discussion was an implicit inventory of current practice. Initially, there was a recounting of their own education, acknowledging HI content, if any, during their course of study. A few participants reported HI had been included in their curriculum while attending university.

> *No, we didn't have any course that was specifically called 'health informatics throughout my student years, right through to my PhD in haematology. (Participant 2, Academic Management FG 1)*

Matters of knowledge and competencies were discussed as well as the need to provide required resources. A key issue identified in this analysis pertained to the absence of informatics resources. The relevance of HI in academia was either misunderstood or unknown prior to focus groups. Consumers commented earlier that academia had not kept pace with the use of technology in their salient profession and program and providers corroborated this. This may explain the alleged complacency towards HI.

b. Consumers

Consumers, particularly those from clinical programs, reported having no HI theory or training during their 4 years in academia. This had not deterred or diminished their interest or commitment to learn more, often their own initiative.

> *In the Nursing program, we didn't have any classes on health informatics. We had a nursing lab for the students and we were very lucky. But, there was no access to a health information system of any kind. (Participant 1, Alumni FG 1)*

Curriculum was assessed as irrelevant and out-dated. Consensus was that both academia and industry were neither confident nor competent in their own HI knowledge and skills. Interestingly, there was general awareness that HI was a new field in healthcare and therefore poorly understood by academia and industry.

> *Neither the college nor the hospitals were good at providing training when I was a student. The hospital staff and even some teachers didn't refer to it as 'Health Informatics' even though it clearly was. (Participant 2, Alumni FG 1)*

The perceived gap in curriculum was common knowledge amongst consumers as was the awareness of industry's implicit expectations that graduates held requisite informatics competencies.

The lack of current, relevant curriculum was noted to be problematic in many academic institutions. Alumni noted several new healthcare professionals did not possess required HI knowledge and skill to perform tasks efficiently and safely.

> *I was in the market and getting real-time information while, I think the education institutions, not just this one, but probably all educational institutions did not catch up with the speed of using technology in the work place as fast as they should have. People who were graduating, even from medical schools – medical students who came as interns and residents to the hospital – they had no idea what electronic health information systems were. (Participant 1, Alumni FG 2)*

Consumers conceded the existing HI content in curriculum was insufficient and/or irrelevant. Unwilling to accept this for themselves or fellow students, plans were laid to investigate and resolve the noted gap. This will be discussed in future plans for HI curriculum.

> *We had classes discussing many different aspects of health informatics and health information systems, but we didn't ever have the chance to work on a system in the college. Everyone working in healthcare needs to know how to use it. It's not fair to the student. (Participant 2, Alumni FG 2)*

The level of exposure to HI curriculum was associated with the program. Nonclinical programs included informatics in the matrix; clinical programs did not. This did not determine either group's comprehension or interest.

Interestingly, every consumer who received HI tuition noted a focus on electronic health records and electronic health information systems. While acknowledging the relevance, consumers suspected there was 'more to it' and wanted to learn more complex functionality.

> *Well, in our classes and during our practicums, the only thing we talk about is the *Health Information System. I would like to know more and agree we all need to have this in our program. (Participant 1, Student FG 4)*

Consumers concluded too much theory existed and was too focused on electronic health records, with no opportunity for practical application. This realization again led to concerns with competencies, knowledge and level of education received.

> *I don't feel this is appropriate education for any Bachelor program in Health and I think we should be learning more about health informatics, especially how this applies to the profession we have chosen. (Participant 4, Student FG 3)*

Consumers purported this was due, in part, to faculty's lack of experience, understanding and knowledge of HI. This conclusion was based on classroom experiences where faculty referred to informatics in unclear and confusing terms.

> *I would like to know more about how it actually works, how to actually use it. I think there are a lot of possibilities and we should be looking into this more, both the student and our*

teachers. Some of the responsibility is mine to learn more. I've enjoyed discussing this with you and I'm going to tell my class and my teacher about the projects we've discussed. (Participant 5, Student FG 1)

Consumers' understanding of HI was attributed to experiential learning. Informatics applications including information systems to connect Emergency Room physicians with paramedic units or information systems to connect insurers with patients after discharge were offered. It was interesting that this same group, having earlier claimed a desire to learn more than "just health information systems" were now devising innovative methods utilizing this very system.

Consumers concluded stakeholders were unaware of their roles and responsibilities. Academia was either ignorant of the need or unable to provide access to requisite informatics applications. Industry partners were not aware of experiential learning requirements and the embedded need for access to HI applications.

Equity of access to resources was also seen as problematic. Consumers from nonclinical programs were not willing to accept expense as a justification.

Pharmacy has labs; Nursing has labs; and of course Med. Lab. has all the lab. equipment. And, we have a table and a chair! (Participant 1, Student FG 4)

4.4.2 Practicum Sessions

Experiential learning was identified as a key component in preparing healthcare professionals in the use of HI and practicums, or work experience sessions, were an integral part of each program's curriculum. Analysis identified the structure, process and outcome of this aspect of academia.

a. Providers

Academic management assumed practicums were proceeding as planned and required. Conversely, most faculty indicated students were routinely denied access to any HI application.

> *My students and faculty responsible for practicums all say the same thing. The students can observe the system but most hospitals are really hesitant to allow the student to actually work with their system – even in 'test'. (Participant 3, Academic Management FG 1)*

Analysis further revealed industry assumed students were provided at least an introductory level of informatics knowledge and skills prior to clinical placement. There was implicit agreement responsibility for informatics training belonged with industry partners.

> *Feedback from Industry to my faculty is that students need a lot of training at the beginning of their practicum, as they don't know how to access patient data or enter test results. (Participant 2, Academic Management FG 1)*

Of note, despite the absence of HI curriculum, a nursing faculty ensured requisite training on relevant applications was provided prior to clinical placements. This initiative was attributed to collaborative planning and communication involving key stakeholders.

> *The hospital has really supported this as it reduces risk and saves their nursing staff the time needed to train students. It isn't really their area of expertise, as nurses, to train in informatics so the students go to the training centres at the hospital and learn from the experts. It has worked really very well. (Participant 3, Faculty FG 3)*

Participants agreed that collaboration between academia and industry was the ideal solution to the deleterious state of practicum preparedness specifically related to informatics competencies.

b. Consumers

Analysis identified two key issues regarding preparedness to utilize HI applications during practicum sessions. Firstly, there was an expectation by hospital preceptors that students had at least basic HI knowledge and skill.

> *Even though we haven't had any classes on it at the college, we're expected to know what it means when we go to the hospital. I'd never heard of it until the Lab. Director told us during our orientation. (Participant 4, Student FG 2)*

Secondly, alumni and students conceded little to no planning had occurred prior to the practicum resulting in a lack of certainty about their roles and responsibilities. This lack of communication was attributed to the hesitance, or in some cases denial, to allow access to HI applications.

> *I have had students arrive at my door and I didn't know they were coming. The college told me that all the documentation was sent to the hospital's Training Department in HR. But, there it sits. (Participant 1, Alumni FG 2)*

It became evident an association existed between the acceptance of and support given to students by hospital staff and the quality of students' learning, specifically pertaining to HI.

> *If we had some forewarning I could work with the IT Department and they would be happy to provide training on *Health Information System to the student. I don't have time to train and my staff doesn't have time to train; but there is a department that's good at it and is happy to do it. But we just need to get them involved! (Participant 1, Alumni FG 2)*

It was notable that students who received training and continued access to informatics applications reported a positive learning experience; this was independent of any previous knowledge of HI. Those having had some informatics tuition noted experiential learning reinforced theory. This resulted in the desire to learn more complex functionality once realizing potential uses of data stored within the informatics system.

> *I was actually helping and learning. I could remember what we discussed in class and it all started to make sense! (Participant 4, Student FG 1)*

Consumers concluded their knowledge improved significantly, if given the opportunity to work with informatics applications. Consumers also noted new knowledge was lost on return to campus due to lack of resources, thus impeding continuity of learning.

An association became evident between positive experiential learning and hospital staffs' expertise and willingness to train and permit access to relevant informatics applications. This outcome was credited to the amount of prior planning that had transpired.

4.4.3 Future Plans

Relevant, current curriculum and access to resources were seen as essential in the provision of complete education. Plans to achieve both evolved.

a. Providers

Participants identified that a clear, contextualized understanding of programs, curriculum, and industry relations were of utmost importance. Accreditation requirements, academic and professional responsibilities were acknowledged as key elements inherently belonging to each of these constituents.

> *As educators, when we're admitting that yes, we're graduating students that cannot do the job, it says a lot about what needs to be done. (Participant 2, Faculty FG 2)*

Additional benefits of HI curriculum, involving a broader scope of stakeholders were envisioned. Professional development sessions for faculty, alumni and healthcare professionals were proposed as a means of fulfilling academic responsibilities, while extending a collegial hand to external stakeholders. Compliance with accreditation standards held multiple benefits; assurance of relevant, complete education would improve student recruitment, have a positive influence on faculty retention and ensure sustained program offering.

> *If we are not accredited because this is not in our matrix and we know about it prior to accreditation, then we're as guilty as anyone else for ignoring the situation. (Participant 1, Faculty FG 2)*

Providers expressed understanding of the potential of HI. Accordingly, their first priority was to research the topic, improving their knowledge and skill. Only at this point could they effectively review program curriculum.

> *It’s our duty to learn as much as we can first, and then to teach, to incorporate the concept of health informatics as much as we can. (Participant 1, Faculty FG 3)*

Providers concluded there was no standardization in theoretical content, practical application, or assessment strategies. Similarly, accreditation, government and industry requirements were inadequately addressed.

Meetings with academic management and faculty were planned to discuss resources. Providers acknowledged informatics software was expensive so attention to integration across the network of campuses was essential. Also, the virtual HI laboratory was discussed and plans made to negotiate access.

This group concluded with plans to meet with industry and government to discuss mutual needs and expectations of key stakeholders in health education. Plans were made to create an online library ensuring access to all faculty; suggestions for integration with curriculum would be discussed at monthly meetings.

b. Consumers

Collaboration was perceived as critical in promoting learning in a realistic, multidisciplinary context. During focus groups plans assumed greater importance, requiring urgent attention and action.

The communication feature of HI was of key significance and participants asserted that curriculum must be designed to incorporate this. Theory must be coupled with experiential learning both on and off campus.

> *I would also like to learn more about other applications because there are many ways to connect the patient with their information and with their caregiver that would do so much. (Participant 2, Student FG 3)*

Consumers described inequity of access to informatics applications and hence inequity of access to quality healthcare. Projects involving popular social media applications were discussed with the goal of improving access for the less fortunate or those who have no access to technology.

> *We have to be sure that all members of the community are included. We could create a project where kiosks are set up in labour camps, where the men and women could access the Internet. We could create pamphlets that would help them find health information in their language. (Participant 1, Student FG 4)*

4.4.4 Similarities and Differences

4.4.4.1 Similarities Between Groups

It was conceded providers and consumers in academia required HI knowledge and skills. Further, study revealed consensus that access to informatics applications was essential to facilitate assimilation of sustainable knowledge.

A new/renewed desire to learn more about HI was prevalent. It was resolved neither provider nor consumer could claim proficient preparedness in HI.

4.4.4.2 Differences Between Groups

Consumers appeared to be more aware of the need for informatics curriculum and resources than providers. Consumers' recent exposure to healthcare and the use of informatics might explain their heightened awareness of relevance and potential.

Analysis suggested a degree of complacency amongst providers regarding the need for informatics curriculum, resources, training and support. Alternatively, consumers articulated a contextualized understanding of the current situation, identifying gaps and offering solutions.

Data suggests most providers had not remained current with professional development. Many admitted an inability to navigate anything more complex than a database containing demographic data. Conversely, consumers were able to discuss HI in contextual detail, regardless of having had any tuition. Consumers were cognizant of their professional roles, responsibilities and requirements pertaining to informatics applications. This theme was less pronounced amongst providers.

Providers demonstrated a resistance to assuming responsibility to improve their HI knowledge, stating this was not their area of expertise and therefore not their responsibility. Consumers readily accepted responsibility while noting some also belonged to academia and external stakeholders.

Only consumers asserted the healthcare industry was not yet competent in its understanding or application of HI. The justification offered was that HI was a new field and seen to overlap several existing health professions; it was noteworthy that Alumni had the clearest perspective of both academic and industry needs.

Chapter 5 – Discussion

Considerable literature exists professing both the potential benefits of and on-going barriers to acceptance of informatics in the healthcare setting (Smith, Drake, Harris, Watson, & Pohlner, 2011). The latter has often been attributed to lack of standards, interoperability issues and fears of confidentiality (Nguyen, Thorpe, Makki, & Mostashari, 2007). The IMIA suggests an element of equal concern is the knowledge and skill of the workforce, claiming, “training [is] needed to most effectively implement HIT systems” (Mantas et al., 2010, p. 106). This contention aligns with the focus of this research, which explores how well academia is preparing future health professionals in requisite elements of HI.

This chapter will examine the findings of the study, relating the themes of HI perception, preparedness and future plans to current research published in literature. Interpretation will further explore how elements of communication, confidence, responsibility and curriculum impact and integrate with these core themes. Embedded in discussions will be the power and importance of focus groups, having become an elemental constituent and key contributor to this research and these findings.

5.1 Interpretation of Findings

The research methodology is discussed in detail in Chapter 3. Findings were interpreted using deductive thematic analysis. Braun and Clarke (2006) suggest, “thematic analysis is not wed to any pre-existing theoretical framework” (p. 81) and go on to note, “it can be used within different theoretical frameworks, and can be used to do different things within them” (p. 81). This concept contributed to the flexibility of this research methodology. The major themes were *Perception, Preparedness and Future Plans*. Sub-themes to emerge were *Communication, Confidence, Responsibility and Curriculum.* Findings will be discussed accordingly.

Exploration of knowledge, perception and meaning assigned to HI and how participants interact with this concept may be explained by symbolic interactionism theory. Williams (2014) suggests one does not simply react to stimuli in their environment, “but instead assign meaning to objects in the world and then, based on the meaning assigned, act toward these objects in specific ways” (p. 850). Symbolic interactionism, as discussed by Blumer (1969), suggests one allots meanings to things as a result of interactions with others, which then influences one’s interpretation of that particular construct (Wagner et al., 2008). This theoretical framework had been selected as it complemented the aim of the project, providing a structure within which perceptions could be shared and observed. The meaning participants assigned to technology in healthcare appeared to have been influenced by their interaction with this technology as well as interactions with their peers. This constructivist philosophy of learning was demonstrated repeatedly as participants reflected upon their experiences with informatics in academic and healthcare settings, subsequently assembling their understanding (Packer & Goicoechea, 2000).

The introduction of informatics to healthcare, and its implicit liaison with technology, are developments that can also be investigated and explained effectively using the diffusion of innovation theory. Rogers’ mechanisms of diffusion and five levels of innovativeness place focus group dialogue and interactions within plausible and contextual categories. Elements of each theoretical framework, specifically symbolic interactionism and diffusion of innovation will be applied to the following discussion of findings.

5.2 Focus Group Forum

Selecting focus groups as a means of exploring participant perception and knowledge of informatics proved to be more beneficial than originally anticipated. Phenomena observed throughout this forum were of significant prevalence, informing the analytic process, and are worthy of discussion to establish context. The goal of the focus groups was to facilitate an environment encouraging group interaction, allowing participants “to explore and clarify individual and shared perspectives” (Tong et al., 2007, p. 351). Complementing this basic premise was repeated evidence of the need to collaborate beyond the focus group.

An unexpected outcome was the development of a common vision and mission that, by all accounts, had not existed prior to these discussions. Plans to operationalize concepts advanced as a result of this opportunity to share insights. This was of key importance and an extension of the commonly envisaged role of this forum. The power of focus groups to facilitate dialogue in a non-threatening setting that is “socially oriented” (Onwuegbuzie, Dickinson, Leech, & Zoran, 2009, p. 2) was realized in this study.

This perceived success might be attributed to several factors. Homogeneity of groups promoted a sense of cohesiveness. Rogers’ description of the categories of innovativeness in relation to acceptance and diffusion of innovation aptly applies to this scenario. Each of these categories was represented in every focus group. A summary of the five categories of system member innovativeness is provided below (*see* Table 11).

Table 11: Five Categories of Adoption of Innovation

Category of Innovativeness	**Description**
Innovators	• Find the potential of the innovation exciting • Possess ability to envision possibilities • Eager to apply the innovation
Early Adopters	• Await confirmation from Innovators and subsequently make their decision • If Innovators' report is positive, Early Adopters encourage others to adopt the innovation
Early Majority	• Pragmatists • Followers influenced by Innovators and Early Adopters
Late Majority	• Conservative pragmatists • Avoid risks and are uncomfortable with new ideas
Laggards	• Last to accept innovation • Perceive acceptance of innovation as high risk

Source: *Diffusion of Innovations*, by E. Rogers, 2003, New York, NY: Free Press. Reviewed by G. Orr.

The keen willingness of 'innovators' to share, train, indeed to lead was particularly revealing. This category of adoption was represented in every focus group suggesting an exclusive group had developed across focus groups that were anxious to evoke remedial action. Similarly, the strong motivation to gain knowledge and requisite competencies amongst the 'Early Adopters' became evident once sufficiently advised and reassured by the former group. Rapid transformation of participants then occurred, as they progressed through the remaining categories concluding with plans to continue the dialogue, now eager to affect change.

Greenhalgh et al. (2004) produced a conceptual model for considering determinants of diffusion of innovations in health service (see Appendix X). This model identifies an "absorptive capacity for new knowledge" as an antecedent for innovation; elements of this concept were visible throughout these focus groups (Greenhalgh et al., 2004). The authors further suggest that organisational culture influences the diffusion and assimilation of innovation if it is able to "capture, interpret, share, reframe, and recodify new knowledge" (Greenhalgh et al., 2004, p. 606). Elaboration of the apparent hesitancy, even inability to perform these tasks, specifically amongst academic management participants, is addressed further in these discussions.

On more than one occasion participants voiced their gratitude for the opportunity to participate in the focus group. The milieu that developed clearly encouraged open discussions. The atmosphere of hierarchy, which was noticeable at the start of the focus groups, subsequently developed into a more levelled field, characterized by more collegiate interactions. Ward (2013) had described health professions as highly autonomous, "hierarchical" (p. 226), even "tribal" (p. 226). Academic management and faculty participants, all healthcare professionals first and now academics, had exhibited these attributes early in the discussions.

However, as sessions progressed and Innovators encouraged and informed Laggards, acceptance of this innovation evolved. The focus group format had delivered these professionals from their "social vacuum" (Kitzinger, 1994, p. 112) with the potential for establishing an inter-professional team with an awakened shared vision.

5.3 Perceptions of Health Informatics

5.3.1 Health Informatics Knowledge

Initially, academic management and faculty admitted to a very minimal understanding of and/or interest in HI. These participants repeatedly demonstrated initial questionable understanding of HI and its relevance to academia. It was commonly defined as a health information system, database, electronic health record or simply technology in healthcare. However, most students and alumni were able to discuss HI applications relevant to their program and profession in exacting detail. Alumni and student focus groups demonstrated an enhanced understanding of HI within the context of their profession and program in academia.

Academic management and faculty discussions suggested an uncertainty of knowledge, thus confidence, regarding HI. Conversely, student and alumni focus groups demonstrated a comprehensive and contemporary awareness of professional roles, responsibilities, career paths, and educational requirements. Consumers demonstrated confidence in their knowledge and perception of informatics; the majority of providers did not. The relative advantage of this innovation in academia and healthcare had been envisioned in a distinctly polarized manner. A prevalent theme amongst academic management and faculty suggested uncertainty of relevance, or returns on their investment and had therefore determined not to consider or pursue the concept further.

Perhaps because of their more recent exposure to the healthcare environment, students and alumni were able to articulate clear, contextualized perception of informatics. Acknowledging the relative advantage of informatics, however, does not necessarily nor immediately translate into widespread acceptance. Greenhalgh et al. (2004) suggests this is a lengthy and complex process involving much negotiation between champions and potential adopters of the innovation despite evidence-based advantage.

Ultimately, both providers and consumers agreed HI knowledge and competencies were important for all health science students, graduates, and faculty. It was generally conceded that the omission of requisite knowledge and skill posed a serious problem to academia and the healthcare industry.

Review of findings suggested the acquisition of this knowledge might have been an outcome of this research. This concept was most obvious amongst provider focus groups. Awareness of the urgent need for informatics tuition and training had now assumed a high priority, suggesting this might partly be a product of the research study. Focus groups had provided a forum for open, frank communication, also possibly contributing to enhanced understanding.

5.3.2 Health Informatics Tuition

Faculty, students and alumni agreed many faculty were neither comfortable nor confident teaching HI concepts. At the conclusion of all focus groups it was generally agreed that an inappropriate level of HI education was currently being provided to health science students.

Recommendations to resolve these were discussed in both provider and consumer focus groups. The act of sharing insights engendered keen enthusiasm with those resisting the concept of informatics visibly transforming to 'innovators', or at least expressing the desire to take action.

This transformation within the provider group might be explained by again applying Greenhalgh et al.'s (2004) model of diffusion specifically pertaining to compatibility with the innovation. Having gained an understanding of the salient purpose of informatics in relation to one's academic roles and values enabled a heightened awareness of compatibility, thus more readily assimilated. Subsequently, faculty and academic management were able to envision how their roles and responsibilities could and should be reinvented to address the needs of all stakeholders within academia, health industry and ultimately, the community.

5.3.3 External Stakeholder Perception of Health Informatics

Alumni and students contended neither the health industry nor government was prepared for informatics. This was attributed to a lack of understanding of the innovation and as it was a new field in healthcare, decisions determining where HI belonged had not yet been agreed upon.

Their assessment concurs with findings by Kushniruk et al. (2006) as discussed in Chapter 2. These authors contend informatics is poorly understood by academic and health sectors alike (Kushniruk et al., 2006). Interestingly, neither academic management nor faculty focus groups made such an assertion. The maturity of consumer's assessment was notable and might be explained by the concept of trialability (Greenhalgh et al., 2008). Alumni and students had been given the opportunity to utilize informatics applications; this same opportunity might not be so readily available to academic management and faculty, being somewhat removed from the healthcare environment. The model of diffusion suggests that experimentation with innovation enhances adoption and assimilation (Greenhalgh et al., 2008).

5.3.4 Health Informatics Policy

A key discovery by students and alumni was the lack of HI policy. These participants asserted this was a core issue enabling acceptance of HI in practice.

Research findings produced by Rigby et al. (2001) would suggest this was a global problem. The contention made by students and alumni was incisive and topical. Adoption and assimilation of the innovation of informatics, allegedly sporadic and hesitant, might be explained by the lack of guidelines, standards and policy.

5.3.5 Cultural Issues

Both providers and consumers acknowledged the potential impact HI may have on all health care professionals and the industry as a whole. Another common theme was that cultural issues were responsible for the resistance to accept HI in practice, both in industry and academia.

Specifically, the lack of trust of HI was cited as having a deleterious impact. The complexity of the system itself compounded by that of human interaction is well documented in literature. Ash and Bates (2005) emphasize the element of trust represents a significant barrier to adoption (see also Introna, 2017). Greenhalgh et al. (2004) submit, “People are not passive recipients of innovations” (p. 598) and suggest there are those who actively seek to discover, comprehend and apply these advances in technology.

Successful adoption of HI depends, in part, on the social network in which it is embedded. Gaining trust, improving knowledge and ensuring sustained use depend on the autonomy and homologous nature of this network. Braithwaite, Runciman, and Merry (2009) suggest sociocultural elements such as “being invited, empowered and nurtured” (Abstract section, para. 4) are fundamental enablers. Allowing natural networks, comprised of health care professionals with similar backgrounds and interests, inviting them to discuss, plan and operationalize informatics applications, was seen as having a significantly positive impact on acceptance of use. Inherent in this model is a bottom-up strategy, in contrast to the preferred top-down approach advocated by Braithwaite et al. (2009).

Transferring these concepts to this research, natural networks of end-user groups (faculty, student and alumni) should have been ‘invited’ and ‘empowered’ then ‘nurtured’ by academic management in the multitude of decisions pertaining to HI curriculum development.

Findings of this research imply some members of academic management were unaware of the advances of HI, and therefore, unaware of the gaps in education, training and support offered to faculty, students and alumni.

Interestingly, the latter two groups discussed this same concept at a level of detail that was ostensibly beyond their experience and education, seemingly fully aware of the current status and the required remedy. Findings indicate this group of consumers was not willing to wait for an invitation to join the dialogue. Rather, they were intent on collecting evidence pertaining to the need for informatics curriculum; providers would then be invited to join the discourse. Consumers of informatics curriculum had inadvertently assumed the bottom-up approach, laying plans to invite and inform providers.

It is also important to recognize academic management as a natural network with salient interests and preferences. Providing this group with the opportunity to be ‘invited’, ‘empowered’ and ‘nurtured’ would seem essential and prudent in the pursuit and provision of complete and current education. Surveying this situation using the bottom-up approach would suggest senior academic leaders had an unmet responsibility to this integral group of stakeholders. The intricacy of the membership of these social networks, consisting of professionals from the academic, health, corporate and government sectors, surely contributed to the scope of adoption and use of HI.

The core meaning ascribed to this technology has been identified as instrumental in successful adoption. If the individual’s comprehension aligns with that of senior management, the assimilation of this innovation would meet with greater acceptance and use. Greenhalgh et al. (2004) submit the meaning given to this innovation can be negotiated and re-framed through extensive dialogue with all end-users. The sociocultural aspect of this research suggests such discussion, ultimately contributing to the alignment of meaning of the innovation of HI, had not yet occurred.

These conclusions occurred as a result of shared insights and apparent new/renewed clarity of perception regarding the benefits of informatics. Greenhalgh et al. (2004) describe this as observability where adoption and assimilation are directly proportionate to one’s comprehension of the benefits of the innovation.

Another discussion, within the context of *Culture*, addresses the collective society within which this research was performed. Some students claimed HI, particularly consumer informatics applications involving the Emirati population, would never succeed. Elements of trust and privacy were seen as the primary contributing factors. Anecdotally, several students enrolled in health science baccalaureate programs reported having no access to the Internet at home. Culture, not cost, was attributed as the cause, specifically citing lack of parental trust in the system. Alumni participants similarly discussed inequitable access to consumer informatics involving the expatriate workforce. Cost was recognized as the cause in this instance.

A report by the WHO (Eastern Mediterranean region) stated all countries within this area had low Internet penetration, with less than 50% of the population having access to this technology (Al-Shorbaji, 2008). This was determined to be a significant challenge, obstructing adoption of this innovation. Richardson (2004), in research on reflective practice in academia in the UAE, concurs that access to Internet has been restricted, even “forbidden” (p. 432) as a means of protecting “daughters and wives from having access to undesirable information and uncontrolled communications” (p. 432). This situation presents a significant threat to the successful adoption and assimilation of HI in many sectors, not only academia. Also, as this is primarily a tribal culture, the individual will ignore personal aspirations and focus on the common good of the collective population. Applying this premise to health care in general and HI in particular, student participants’ assertion that informatics would achieve little success may indeed have merit. Alternatively, students reported incidents whereby an elder member of the family appreciated the opportunity to communicate with his physician abroad, confirming Greenhalgh et al.'s (2004) discussion of trialability and its positive impact on adoption of innovations.

5.4 Preparedness for Health Informatics

Alumni and students appeared to be more aware of the actual need for HI curriculum and resources than providers.

As the former group had the most recent exposure to the healthcare setting and the use of informatics, this might explain their heightened awareness of its relevance and potential. This would not, however, explain the lack of awareness initially demonstrated by most academic management and faculty. As noted earlier, informatics was a relatively recent addition to healthcare; it would seem reasonable to assume academia had kept pace. Research suggests that the introduction of HI "poses new challenges to academics who are involved in the delivery of the programmes" (Huang, 2007, p. 91). Preparing graduates would now require tuition involving a broader scope of theory and practice to align with the integration of informatics with core curriculum. Research performed by academics tasked with this very issue suggests health science students "will need to be taught about the distinctions between syntactic and semantic representations and about cognitive, social and pragmatic theories" (Kulikowski et al., 2012, p. 936) used in HI. The goal of providing complete and relevant education has acquired another layer of complexity. Associated with this is the emerging impact on educational budgets, staffing requirements and qualifications, all of which present as potential barriers to effective curriculum development.

A degree of complacency existed amongst academic management and faculty regarding the need for informatics curriculum, resources, training and support. Conversely, students and alumni articulated a contextualized understanding of the current situation, identifying gaps and offering solutions. The maturity and depth of perception of this group was remarkable and one that was sustained throughout discussions with consumers. Providers' ignorance of the relative advantage of informatics to their salient health academic profession might explain their lack of awareness, enthusiasm, even commitment. The evolution during focus groups from 'Laggard' to, at a minimum, 'Early Majority' would corroborate this claim. Academic management and faculty who entered the focus group with a novice understanding of informatics in academia were subsequently influenced by the insights shared with 'Innovators'. Members of these focus groups had been given the opportunity to co-construct meaning to the concept of informatics as a result of interaction with peers in their social environment (Aksan, Kisac, Aydin, & Demirbuken, 2009).

5.4.1 Professional Development

The findings suggest that most faculty had not remained current with their professional development. Many admitted an inability to navigate through anything more complex than a database containing demographic data.

Compliance with professional development has often been reported as problematic, in spite of commonly being a condition for employment. Research has identified several causes; heavy workload, lack of leadership, lack of support, complex administrative processes listed as most prevalent (Leibowitz, Bozalek, van Schalkwyk, & Winberg, 2015).

Reflecting on academic management focus groups, pertaining to their self-professed lack of informatics knowledge may represent a lack of leadership and support. While this does not excuse noncompliance with professional development requirements, it does provide context, allowing enhanced understanding of the scenario.

Leibowitz et al. (2015) suggest institutional context also has an impact on academics' ability/desire to pursue professional development opportunities. The concept of institutional context is comprised of other entities including history, geography and resources. While the concept of resources might not be seen as problematic to the academic institutional context of the UAE, history and geography could clearly pose a challenge. Higher education offerings, particularly for Emirati women, were a fairly recent development. HCT (n.d.) was founded in 1988 and was one of the first institutions to include the female population. The ability to attract, retain and nurture academics to this young, developing organisation could be difficult. The geographical location also had the potential to dissuade faculty from pursuing professional development with many conferences and workshops being held abroad. In this instance, it could be argued that resources did indeed influence professional development decisions.

A systematic review of HI education revealed the number of academic papers produced by authors in the Middle East region was the lowest when compared to its global counterparts, with only two published papers found (Mantas, 2016). The absence of informatics resources in this region may have contributed to the hesitancy, thus inability, to pursue academic professional development.

Conversely, most consumers were able to discuss HI in context and detail, regardless of having had any tuition. Analysis revealed Alumni were aware of their professional roles, responsibilities and requirements pertaining to HI applications. Similarly, students demonstrated a clear vision of their future career and the need for continuing education, as a professional requirement as well as a means to advance. This theme was less pronounced amongst providers.

5.4.2 Communication

The findings indicated ineffective communication between academic management and leadership as well as with their faculty and students. This was evidenced by the fact that few, if any, knew the status of matrices within the health science division, accreditation requirements for programs offered, or the requisite graduate outcomes required by their future healthcare professionals.

All focus groups stressed that ineffective communication must be improved amongst all stakeholders. The lack of awareness of these elemental details potentially contributed to the lack of preparedness for HI in academia.

A key issue contributing to this concern for the quality of communication was that so few knew of the academic HI software that had been given to this institution. No academic management or faculty participants offered to explain why this had occurred and as previously discussed, no responsibility taken. While this is hopefully an isolated case in health science academia, it may be representative of the prevalent sense of complacency that exists, or at least existed prior to these meetings. It is questionable, in the absence of this focus group, how long the ‘Innovators’ might have taken to share their knowledge and insight with colleagues. Westrum (2004) defines organisational culture according to its method of processing information. Accordingly, this scenario would belong to the “pathological” category whereupon information is seen as a personal resource to be used to one’s personal advantage (Westrum, 2004).

Table 12: Types of Organisational Culture

Type of Organisational Culture	Characteristics
Clan	• Focused on internal environment • Emphasizes flexibility to the detriment of stability and control • Offers employees possibilities to act genuinely, to speak their minds and to behave in ways which align with their core values and beliefs
Adhocracy	• Focuses on external environment and emphasizes flexibility, entrepreneurship • Employees seek to differentiate themselves through creativity
Hierarchy	• Focuses on organisation's internal environment • Searches for stability and control • Employees hesitant to verbalize opinions or initiate innovation beyond dictated roles and responsibilities
Market	• Focuses on external environment with emphasis on control • Competitiveness and results of key importance • Employees ignore personal core beliefs and values in pursuit of results

Source: Perceived Organizational Culture and Engagement: The Mediating Role of Authenticity, Reis, G., Trullen, J., Story, J. (2016).

Reis, Trullen, and Story (2016) suggest the ability and desire to be authentic in one's work effects their commitment to and engagement with their roles and responsibilities. Organisational culture determines the level of authentic thought and behaviour, and therefore has the potential to influence motivation, innovativeness and commitment. Inherent in all of these characteristics is the ability to communicate effectively. Reis et al. address organisational culture from the perspective of adhocracy, clan, hierarchy and market cultures, which are defined in Table 12. It is their contention that hierarchical and market cultures constrain authenticity in favour of "order and control" (Reis et al., 2016, p. 109). These concepts would seem to align with the organisational culture espoused by academic management and faculty. This might also explain the deleterious state of dialogue and effective communication between and amongst each group. Some faculty indicated a sound comprehension of informatics and the need for its inclusion in curriculum and yet demonstrated little evidence to suggest any initiative or innovative planning had been discussed or planned.

Alumni and students, however, verbalized and demonstrated a keen interest in HI and an understanding for its potential to improve health outcomes, throughout the duration of their focus groups. This indicated the lack of interest from the former two groups had not transferred to these latter two groups. Possibly, the profound interest and understanding demonstrated by consumers would transition inversely to providers. Evidence of this is discussed in Future Plans Relating to HI.

Academic management, as the result of the self-assessment imposed during the focus group, admitted there were communication problems. Their discourse also acknowledged the significant impact this had on their salient preparedness and subsequently that of their students, graduates and faculty.

The need to include all stakeholders in conversations and planning efforts became the focus of most provider discussions. This might suggest a migration towards a clan culture and a stronger emphasis on flexibility, which in turn might foster more authenticity amongst this group of academics.

5.4.3 Health Informatics Knowledge and Competency in Academia

Alumni claimed academia was negligent in providing requisite graduate competencies relating to HI. This was attributed to the diversity of academic management and faculty knowledge of and competency with informatics, which they subsequently transferred to students. Alumni further elaborated, suggesting academia had equipped them with unnecessary, irrelevant informatics competencies, citing the practice of patient registration as an example.

Students declared disparate degrees of competence with HI applications. Most students admitted they did not possess the required skills to navigate HI applications salient to their chosen profession. This conclusion was primarily as a result of practicum experiences; students were faced with the admittedly frustrating reality that while they understood the concept, they could not use the applications.

The need to develop sustainable knowledge and competency is a primary concern of organisations such as the IMIA (Haux, 2000). Their focus is development of an informatics curriculum framework intended to educate and train the diverse dimensions of health professional: clinical, allied and support. Curriculum developed by IMIA addressed the concerns voiced by students and alumni. A framework for informatics curriculum had been developed by an international group of health care professionals/educators. Providers need only access this tool for use amongst their salient health science programs to ensure curriculum was complete and current. Focus groups served as evidence that this, as yet, had not happened. This might be attributed to the apparent noncompliance with professional development as well as the result of ineffective communication.

Some academic management and faculty demonstrated resistance to assuming responsibility to improve their HI knowledge, stating this was not their area of expertise and therefore not their responsibility. Students and alumni readily accepted responsibility themselves while noting some also belong to academic management and external stakeholders.

A process of change became evident as result of focus groups. Academic management and faculty expressed a new or renewed desire to learn more about HI with the goal of improving competencies and knowledge. Academic and professional responsibilities appeared to have been revisited and acknowledged.

5.4.4 Health Informatics Resources

Participants in this study conceded that HI has great potential to improve healthcare outcomes. Consequently, it was agreed that faculty must receive support, training and resources to ensure they can prepare and provide appropriate levels of theory and experiential learning. Until such time, preparedness to comprehend and apply HI would be an issue.

Consumers and providers agreed access to HI software was paramount. It would enhance their understanding of the concept, reinforce theory and facilitate assimilation of this new knowledge. Alumni and students also conceded that the responsibility to investigate HI applications for use in projects belonged not only to academics, but to the student and alumni as well. This duty was assumed with determination and enthusiasm.

Greenhalgh et al. (2004) discuss various conceptual and theoretical bases for the “spread of innovation” (p. 590) along a continuum (see Appendix Y). The starting point involves those who ‘let it happen’, progresses to those who ‘help it happen’ and ultimately concludes with those who ‘make it happen’. Applying this concept to this research, students and alumni enthusiastically embraced the responsibility to ‘help’ and ‘make’ HI ‘happen’ both in academia and in industry. As a result of the focus groups, a growing number of faculty and academic management demonstrated the willingness and desire to affect this *spread of innovation.*

5.4.5 End-Users of Health Informatics

A similar evolution has been documented in the government and health sectors. Studies focusing on the acceptance and uptake of this innovation have revealed a range of perception, knowledge and application that parallels the findings of this study. Issues related to the implementation of technology are often cited as the cause for various levels of acceptance. Literature suggests a shift in focus to that of co-creation involving representation of end-users is needed (Taylor, 2014). Consumers and providers made similar claims throughout their discussions of plans to affect change. They suggested only when academic, government and health sectors were brought together would this situation improve.

Consumers went a step further noting another key stakeholder to be included was the Community. This oversight by providers has been similarly documented in research (Urowitz et al., 2008) and might be seen as an accurate representation of assigned relevance, a reality for many in this environment.

5.4.6 Support from/for Stakeholders

All participant groups noted a decided lack of support from the healthcare industry. Students and alumni suggested this was due to a lack of policy and guidelines directing hospitals in their responsibility to health science students. It was their belief neither the government nor health sector knew what to do with HI, firstly, within their own organisations as well as with their partners in academia.

Ward (2013) suggests those responsible for implementation of HI view its importance, relevance and purpose differently from those on the “front line” (p. 224), resulting in unmet goals and increased resistance to use. It could therefore be understood why consumers and providers perceive a lack of support and the need for governance, both having been subjected to this in their pursuit for experiential learning.

Including the patient in decision-making supports the shift from an illness to wellness model of health care delivery. The Internet has forced the hand of the more traditional healthcare professional that favours a paternalistic relationship. Patients now go online to gain knowledge and subsequently a voice in their own healthcare. HI admittedly has the potential to empower patients and families, making them an active member of the healthcare team, resulting in improved compliance and health outcomes (Mantwill, Fiordelli, Ludoph, & Schulz, 2015). This rather recent development has met with resistance both from the provider and consumer of health. Issues of trust, access, health literacy, quality of health information as well as the more practical issues of governance and reimbursement have been cited as contributing to resistance of use. Eysenbach and Jadad (2001) suggest healthcare providers may wish to “shift from the authoritarian or informed models to a shared one” (“Barriers Related to Providers,” para. 2) but the lack of return on investment of time and expenditure as well as the inability communicate virtually are prohibitive. Compounding the complexity is the socioeconomic element, which continues to plague the health industry. HI might contribute to significant improvements in health outcomes, but only if the end-user has the capacity to afford and access this technology. Research suggests informatics may indeed “further empower the empowered” (Wangberg et al., 2008, p. 70), thus detracting from the global vision of equal access to all.

In this research, students and alumni acknowledged this situation and discussed solutions, which focused on involvement of all key stakeholders: government, healthcare, academia and community. The maturity and depth of consumers’ perception was impressive; also notable was the omission of any such awareness amongst the provider group. Again, this is a situation, which may exemplify the continued existence of barriers to this technology. It might also relate to Greenhalgh et al.'s (2004) definition of relative advantage of an innovation as discussed earlier.

5.5 Future Plans Pertaining to Health Informatics

All focus groups resolved health sciences students were receiving an in adequate level of HI education. As shown in the study findings, providers and consumers came to this realization from divergent paths, yet eventually all arrived at this collective conclusion. Regardless of levels of perception, knowledge and competency at the outset, all focus groups concluded with discussions of collaborative efforts to affect change. Issues relating to curriculum, communication, responsibility and governance were seen as paramount; future plans unfolded accordingly.

Greenhalgh et al. (2004) identified a metaphor for spread of innovation whereby one makes sense of the concept by first constructing knowledge and ultimately progresses to re-engineering their own scope of practice. As a result of shared beliefs and knowledge, consumers and providers described strategies, with this as their ultimate goal. A listing of these strategies offered by providers and consumers follows.

5.5.1 Providers

Providers became aware of their academic and professional responsibility to acquire HI knowledge and skills, which would complement their role as educators.

The following is a summary of plans that were highlighted during academic management and faculty focus groups (see Table 13).

Table 13: Providers' Future Plans Regarding Health Informatics

Providers
• Research health informatics pertinent to their salient healthcare profession to improve knowledge • Review matrices to determine which programs contained Health Informatics curriculum • Review accreditation requirements per program re: health informatics requirements • Benchmark with academic institutions offering similar health science programs to determine best practice • Develop standardize curriculum for use across programs • Improve communication with all stakeholders • Initiate dialogue with Academic Council regarding health informatics resources and faculty support • Arrange meetings to discuss needs and expectations pertaining to health informatics • Include Health Informatics as permanent agenda item • Meet with academic council and hospital management to investigate health informatics training in all programs • Meet with industry partners to inform of student knowledge and capabilities and requirements during experiential learning sessions • Provide industry partners with overview of matrices and curriculum • Improve collaboration and adopt a more team-oriented framework involving internal and external stakeholders • Offer professional development sessions in informatics to faculty and any interested external stakeholder • Provide industry partners with overview of matrices and curriculum • Ensure compliance with governing and accrediting bodies • Include HI governance and policy in curriculum • Investigate unused academic informatics software

5.5.2 Consumers

Alumni and students agreed that HI must be included in all health science programs and that access to relevant informatics applications was essential to complete their education. A summary of future plans discussed by alumni and students follows (see Table 14).

Table 14: Consumers' Future Plans Regarding Health Informatics

Consumers

• Align industry need with curriculum seen as critical
• Involve industry partners in discussions of health informatics to discuss:
  ○ Access to resources
  ○ Competencies required per healthcare profession
  ○ Practicums
  ○ Curriculum
• Improve experiential learning opportunities to ensure access to requisite informatics applications
• Improve academia and industry awareness of health science programs, including inherent needs and capabilities of students and graduates
• Collection information from all stakeholders, beginning with students and then present findings to
  ○ Academia
  ○ Industry
  ○ Government
• Presentation to above noted stakeholders re: programs, highlighting current and future needs; industry partners would be invited to do same
• Survey students to determine understanding of health informatics and gain perception of their needs; prepare and present report to college and industry
• Workshops, information sessions including all stakeholders of health
• Improve communication with all stakeholders
• Discussions regarding health informatics skills & knowledge to begin at corporate level to ensure successful implementation
  ○ Corporate-to-corporate level
• Improve communication – get everyone together including government
• Face to face and virtual meetings, poster presentations, needs analysis and information sessions with all health science programs across campuses
• Establish committee with reps from academia, healthcare to review practices, policies re: health informatics

- Would guide practicums and curriculum design
- Integrated projects involving students and key internal and external stakeholders
- Meetings with internal and external stakeholders to address health informatics resources and governance
- Improve collaboration by:
  - share resources such as virtual health informatics lab. and global informatics matrix for HIM
  - train hospital staff informatics using students, alumni & management as project leads
- Workshops, information sessions including all stakeholders of health
- Develop informatics policy; create method of informing all stakeholders
  - Seen as root cause of resistance to use
- Improve knowledge of security regulations
  - Addressing resistance to use
  - Cultural influence – gain trust
- Workshops, information sessions including all stakeholders of health
- Development of international integrated health information system

As discussed earlier, the health sector has been described as a complex environment representing a culture that is hierarchical, almost tribal, in nature. Inherent with this is the culture of the organisation. Westrum's (2004) definition of a pathological culture, one that is power oriented and invoking little to no cooperation or collaboration might be seen as applicable to many aspects of this research setting, particularly from the provider perspective. Alternatively, students and alumni embodied a more generative organisational culture, creating a milieu of cooperation and sharing. As noted earlier, participants were affected by the open, nonthreatening nature of the focus group, facilitating negotiation and ultimately the transfer of knowledge from Innovators to Laggards.

5.6 Research Findings in Context

A key point to emerge from thematic analysis of these focus groups was the urgent need for HI curriculum. As discussed previously, the impetus behind this was varied: academic responsibility, accreditation, addressing stakeholder need. Research by Campbell, Pardue, Longenecker, Barnett, and Landry (2012) supported this assertion, stating it is now an expectation that all healthcare workers have requisite informatics knowledge and skills. The education and training essential to produce and support this contention, however, was decidedly lacking. It was recommended that curriculum, incorporating technology, information systems and the salient needs of each health profession be developed. The majority of participants in both provider and consumer focus groups ultimately came to this conclusion and made a similar recommendation.

The scenario at this academic setting is no different from many of its global colleagues. Research performed by Hovenga and Grain (2016) suggests the health and academic sectors have yet to establish a global informatics "body of knowledge" (p. 336). These authors assert, as did some members of the consumer focus groups, that HI "is not well understood" (Hovenga & Grain, 2016, p. 336). Accordingly, health professionals and academics have difficulty determining how to proceed. Interestingly, consumers recommended academia needed to 'ask the question' of its industry partners in order to guide development of informatics curriculum.

Hovenga and Grain (2016) offer a similar recommendation. The basic need to communicate may again be determined as a contributing factor in this situation.

The design, implementation and maintenance of HI in the academic and health sectors rely upon the support and guidance of policy. Bell (2018) advises such policy is the responsibility of government as well as the aforementioned stakeholders. Participants of consumer focus groups were noted to make the astute conclusion that in the absence of policy, the government, health sector and academia did not know how to plan for or operationalize HI (see Section 5.3.4). The perceived importance and relevance of informatics had apparently been acknowledged, as evidenced by the purchase of health information systems throughout the UAE. The framework essential to successful implementation was either not known or not shared with relevant stakeholders. This conforms to tenets of the hierarchical organisational culture whereby the focus is on control and is internalized within the organisation; elements of flexibility and authenticity are resisted. These represent clear barriers to informatics curriculum development.

The integration of HI in academia has met with varying degrees of success. Providers cited several issues contributing to this situation; lack of time, support, resources, knowledge and interest to name a few. Smith and Agresta (2010) note that academia has maintained/obtained a low profile in discussions of HI curriculum while colleagues with a "business, political or advocacy" (p. 1108) interest have dominated the discussions. In the absence of full, contextual understanding and knowledge of HI, providers initially found difficulty in entering similar discussions. However, as previously noted, once insights and experiences were shared, resistance to this new concept diminished. Consumers' discussions, however, suggested awareness of the need for multidisciplinary expertise in strategic and operational planning of HI. Their scope encompassed stakeholders from all sectors (government, health, and academia) and many were able to support this contention with evidence of considered and realistic planning.

Recent research performed in the UK continues to indicate that HI curriculum requires further development, evaluation and integration in health science programs, recommending the development of national guidelines (Walpole et al., 2017). Both providers and consumers noted the need for a standardized framework outlining roles and responsibilities, which would provide valuable guidance for professionals in both the health and academic sectors.

5.7 Summary

This chapter has included a discussion of findings resulting from focus groups and has been compared to findings of similar research addressing HI curriculum. The results have been reviewed using the constructs of diffusion of innovations theory.

Issues relating to enablers and barriers to the development of informatics curriculum have been examined. Application of models described in Chapter 3 has been beneficial in providing detailed, contextualized understanding of the elements surrounding each phase of this diffusion of innovation.

Knowledge gained as a result of these findings will be instrumental in designing and developing core and salient informatics curriculum. Imperative to the successful development and implementation of this curriculum is an awareness of elements embedded in each phase of diffusion of innovation models. Of equal importance is the need to target and improve communication, confidence and acceptance of responsibility. Attention to these features would surely benefit current and future curriculum design.

Chapter 6 – Conclusion

A summary of the thesis and discussion of limitations of this study are discussed in this final chapter. A reflective commentary is also included, describing the experiences encountered throughout the life of this study, actions taken and lessons learned as a result. Finally, suggestions for future research are outlined.

6.1 Summary of Thesis

This thesis addresses a topic that appears to remain a concern of the academic community, that being the perception, knowledge and application of HI in health science curriculum. While there appeared to be overwhelming agreement of the need to incorporate this topic in matrices as discussions concluded, a concern remains as to the environment in which these discussions began. As noted previously, the health sector appears to have taken the lead in operationalizing HI applications; academia is working diligently to maintain pace, aligning graduate knowledge and competencies with industry's needs.

A prevalent finding arising from this study was the decided lack of confidence in perception of and preparedness for HI in salient health-related academic professions. This finding concurs with research performed by Hersh (2009) and Kushniruk et al. (2006) both contending HI is poorly understood. Academic management and faculty were often unable and/or unwilling to determine if the use of technology did in fact equate to HI. This, in turn, contributed to their patent sense of hesitancy to enter into discussions. A similar scenario was witnessed throughout consumer focus groups. However, in every focus group there was at least one informatics 'champion' who was able to engage, encourage and educate peers. The dynamics of the focus group contributed significantly to the breadth and depth of discussions as participants relaxed, allowing the protective walls, which had kept them in their silo, to come down.

The resultant enthusiasm was unexpected and most noteworthy, as participants transitioned from ‘laggards’ to ‘innovators’, all within the span of one focus group. This momentum continued following the conclusion of focus groups with arrangements for subsequent meetings being made. As an example, the Nursing faculty had established a training program in collaboration with partners in the health sector in which students attended EHR sessions hosted by the hospital’s training staff, prior to their clinical placement. This innovative, collaborative approach proved most successful with the salient needs of the health and academic sectors being met. Accordingly, participants attending that focus group made arrangements with the faculty member from the School of Nursing to determine how a similar training program could be incorporated with their program’s curricula. Awareness of the importance of HI applications to each health program and profession had been realized. Subsequent planning meetings were held involving representatives from both sectors with the goal of establishing training sessions for health science students that were relevant, effective and manageable. Students from each program joined future colleagues of the same profession in an experiential learning environment. Faculty who had initially demonstrated hesitancy in designing and implementing HI curriculum, including those who earlier decided to “give it a miss”, were now working with industry partners and colleagues in academia to create an effective teaching and learning environment. The sustainability of this transformation from ‘laggard’ to ‘innovator’ had been established. Anecdotally, a visit to these centres in UAE in late 2019 provided evidence that all schools of health had now integrated this collaborative training approach with their teaching strategies.

As focus groups concluded participants from both consumer and provider groups conceded the importance of HI and the urgent need to incorporate this in curriculum. Both groups also agreed it was critical that students and faculty be provided with access to informatics software, thus facilitating acquisition of requisite learning and competencies. Research performed by Hammoud et al. (2012) described a similar situation in which students had to access to health information systems as part of their experiential learning.

As discussed, alumni and students demonstrated a perception of purpose, potential and need at a level initially superior to that of most providers. Alumni and students both noted that HI overlapped many professions in the health sector, a claim that concurs with research performed at the Vanderbilt University Medical Center (n.d.). This might be explained by their more recent exposure to this technology in healthcare. However, the professional duty to remain current in one's area of expertise would suggest faculty and academic management should have shared the same acuity of perception at the outset. Reflection on transcripts and themes suggested many Providers did indeed possess knowledge and understanding of HI, however, their confidence in this knowledge were lacking. Explanations for this are matters for further study but cursory review suggests providers and consumers shared a similar experience; with no opportunity to trial the technology their construction and transfer of knowledge had been compromised.

Ineffectual communication, a dearth of governance and leadership and pathological organisational cultures were seen as major contributing factors. Compounding this is the complexity of the union between academia and the health sector whereby each profession historically tends to exist unto itself. The concept of collaboration and 'co-creation', while viewed as necessary, was not always achievable.

Countering all of these barriers were the benefits realized through shared dialogue, vision and ultimately knowledge. Academic management and faculty could initially be labelled as Laggards in the continuum of diffusion of innovation. They appeared to be willing to 'let it happen' rather than co-author any transformation in this academic setting. However, as noted, influenced, encouraged, educated by Innovators, those less confident in their knowledge of this innovation soon transformed to Early Adopters at minimum. Enthusiasm to assume academic and professional responsibilities was renewed by all providers.

Alumni and students appeared to possess a clear understanding of HI and many of the requisite elements needed to ensure proper education and training. While not professing to know the full extent of the role and responsibility of academia, they portrayed an awareness of the complex setting and a willingness to support faculty and fellow students.

The focus group forum was instrumental in knowledge construction, diffusion, negotiation and knowledge transfer—all elements of Greenhalgh's model. Participant discussions visibly transformed along this established continuum, resulting in dissemination of knowledge and the ability to envision and confidence to discuss future plans concerning HI curriculum.

The status of HI in all sectors (health, government, academia) continues to be the topic of much research. The potential to effect great improvements in the health industry seem patently obvious; yet, testimonies of success of any scope seem few. Literature has suggested several contributing factors. The focus of this research was academia's role and responsibility in this scenario. As discussed, training of health professionals and health educators is an area, which continues to be described as complicated, complex and noncompliant with every stakeholder's expectations and requirements. Investigating these concepts in the UAE provided a unique opportunity, as there was robust impetus and support to develop the academic and health sectors. Satellite universities and health facilities from global leaders had been established in the two major cities of Abu Dhabi and Dubai. Drawing from the expertise of international health professionals recruited by these establishments presented as an incredible opportunity. This small country had occasion to take the lead in designing and implementing a nation-wide integrated health information system; a claim not many nations could make. The UAE could benefit from global lessons learned and accordingly incorporate HI applications in its relatively young and evolving health and academic sectors. Nothing, as yet, had been done; the significant costs associated with the design, implementation, education and maintenance of HI would apparently not pose the same problem as experienced by many of its global partners. Considering all of this, it was disconcerting that the UAE found itself on the same path as many of these same leaders whose knowledge and services it had hired.

This environment presented a unique opportunity to research this timely and significant topic. Ensuring academia aligns curriculum and experiential learning with industry need and requirements is no small undertaking. Quality of health outcomes is seen as the ultimate beneficiary. These are claims difficult to dispute. Investigating the pathway leading to this academic institution's perceived hesitancy to keep pace with HI advancements was of primary interest. As described in earlier chapters, the academic sector was comprised of faculty with international expertise. This presented as a unique opportunity to gain global perspective within the confines of this establishment. Accordingly, findings from this investigation would be instrumental in the design, delivery and assessment of HI curriculum.

6.2 Limitations of the study

By undertaking this research it has been possible to gain an insight into the perceptions, competence and envisioned plans pertaining to health informatics in the academic sector of the UAE. Every attempt was made to minimize any potential limitations of this research. However, the following is a discussion of possible and actual limitations of this research.

Limitations existed, as the researcher was a faculty member in Health Science program at the research setting. Academic management and faculty were colleagues; the researcher was an instructor to many students and alumni. The unintended implications this may have had on the research are summarized here:

- Participants may have chosen to remain silent rather than share insights, for fear of receiving any potential judgement and/or recrimination. The 'peer evaluation' aspect of focus groups, wherein participants are asked to share perceptions, knowledge experience with HI may reveal professional shortcomings. Therefore, the tendency to not fully disclose their thoughts and opinions existed.

- Members of Academic management may have shed a positive light on all conversations to deflect any criticisms of management style and effectiveness.

- Expatriate faculty and academic management participants may choose not to share any thoughts that could be seen as a criticism of the academic management for fear of recrimination and possible termination.

It is difficult to conduct research in a country that is constructing its governing framework at the same time that the research was being done. This was because (a) essential guidance in the form of policy and procedure was either non-existent or in draft form providing insufficient time for operationalization and evaluation, (b) rules and regulations pertaining to public and private health sectors appeared divergent in nature, reinforcing the urgent need for governmental infrastructure.

Education of students whose second language is English is complex. Added to this scenario is the sociocultural aspect of the environment. Students and alumni are Emirati. This is a collectivist culture, and one that assigns great significance upon respect for elders and those in positions of authority. Accordingly, establishing an effective teacher-student relationship, and subsequently an effective researcher-participant relationship required careful attention to these parameters and barriers. It is not possible to ensure either element was completely or successfully mitigated during this research.

The environment within academia involves multiple human interactions that can be difficult to study or explain in simple terms. While this is a key goal of this research, it is also a recognized limitation of the study.

The research setting involved a network of academic institutions situated throughout the UAE. Focus groups were conducted either in person or by virtual meetings. The latter platform may have had a negative impact on participants' sense of engagement and may have limited their responses.

This research involved a total of fifty-three participants. While Health Sciences was one of the smaller faculties within the network of colleges, this may be considered a small representation, therefore lacking rigor. Also, issues of anonymity and confidentiality could be problematic due to the sample size and researcher relationship.

Research quality depends heavily on the skills of the researcher. This was the researcher's first qualitative research project. Therefore, the unintended impact of the researcher's inexperience has significant potential to influence the objectivity and credibility of each phase of this research project.

As noted, the researcher was a faculty member of the health information management program with a keen interest in health informatics. The ability to completely hold this personal and professional interest in abeyance would not be possible.

The focus group forum itself had potential limitations, as it is possible discussions were too focused on a pre-defined list of questions and topics. In this framework, it is possible for important information to be missed. Alternatively, lack of structure could also be problematic as the goal was to collect information on various perceptions and perspectives. During some sessions, the discussions deviated somewhat from the focus group guide. This was allowed as this discourse was providing valuable information but did result in some topics not being covered due to time constraints.

Further limitations existed in the limited scope for checking reliability of interpretation of data from the focus groups. To counter this, two experienced researchers as well as the practice-based supervisor reviewed a sample of transcripts and coding framework on a regular basis. It would be preferable for analysis to be done by more than one person to enable validated interpretation of data. Due to time and funding constraints this was not possible.

6.3 Reflective Commentary

This thesis documents a research journey involving academics engaged in developing and delivering education in the Middle East region. Also involved were Emirati students and alumni who have been tasked with the challenge and opportunity of acquiring then applying their knowledge and skills in most if not all sectors of the UAE. As a result of discussions with this diverse group of participants, the overwhelming message was of the need to communicate and collaborate. The unintended, unanticipated outcome of this research project, which has since been characterised as a key significant outcome, was the impact of the focus group forum. Discussions of this have been addressed in various chapters of this thesis, but merit repeating here. As the researcher, I observed participants sharing their thoughts and visions and frustrations in what had become an open, non-threatening, often enthusiastic setting. Participants from every group demonstrated evidence of learning from their colleagues and assimilating this new/renewed knowledge during the span of the session. It could be said that the enthusiasm of some was contagious amongst those less comfortable and conversant about the topic. However, what was witnessed on more than one occasion, were plans to meet following the session in order to continue the dialogue. As a colleague, I witnessed this sustained activity as faculty from each health program made and took the time to meet, review curriculum with a focus on integrating HI and to subsequently design interdisciplinary projects. It was apparent that, in this instance, the opportunity to communicate and collaborate with peers was the impetus needed to set this task in motion.

During the course of this research the findings and transferrable lessons were discussed with my supervisors. This was most helpful in refining and defining the project as it evolved and developed over time. Formative feedback has been provided to the college network involved in the study. A presentation of the research, while still in progress, was made to the annual faculty forum attended by all faculty, staff, and management from the college network.

6.3.1 Research Dissemination

Since the beginning of this project several changes have taken place. In 2016, I returned to my home in Vancouver, Canada and assumed a similar role in a health sciences college. Interestingly, similarities exist in regional and national academic institutions. Health science programs in universities and colleges work diligently to develop informatics curriculum. Canadian faculty and students make the same claim as that heard in the UAE, specifically that access to HI applications during clinical placements in the health sector is often denied, thus impeding effective, sustainable teaching and learning.

Information and knowledge gained as a result of this research has advanced my abilities to develop teaching and learning strategies that align with the many stakeholders of health profession education. Recognizing the importance of communication and collaboration, I initiated an interdisciplinary informatics project with a colleague from the psychiatric nursing program. Students from each program presented cases using an academic EHR to highlight the salient roles and responsibilities of each profession. The unintended outcome of this project aligned with that of this research. Providing students with the opportunity to meet with colleagues from other programs, to discuss and demonstrate HI applications in an informal setting reinforced student learning, confidence and pride in their chosen profession. This interdisciplinary project, entitled the *Informatics Café*, resulted in my colleague and I receiving an award for disruptive practices in education in the province of British Columbia. Since that time we were selected to present our project at the annual IFHIMA congress held in Dubai, UAE in 2019 (IFHIMA International Congress, 2019). This provided the opportunity to connect with former colleagues and students and to discuss recent developments in the domain of health informatics in the UAE. More recently, we have been selected to present at an upcoming conference sponsored by Digital Health Canada (n.d.).

Since returning to Canada I have been invited to join a project team responsible for developing an academic EHR. The BC Ministry of Advanced Education initiated this project (BC Campus, n.d.). Membership consists of representation of all tertiary level academic institutions within the province and includes key clinical and nonclinical health programs. The final product, referred to as "EdEHR", was recently trailed and will soon be made available, as an open resource, to all academic institutions within BC and eventually to our partners across Canada. The collaborative approach of the project allowed me to revisit knowledge gained as a result of this research project. Sharing this context with members of this project team has provided valuable direction in design and implementation methodology. Since that time, I have co-authored an article entitled, "Development of an Interprofessional Educational Electronic Health Record" (Rees et al., 2019). Work in this project team has provided the opportunity to operationalize many of the findings of this research. Specifically, the system must include careful attention to open, collaborative communication, equitable access to resources and establishment of policy to guide every aspect of curriculum design.

6.4 Contribution to Knowledge

At first glance, it would appear the adoption of ICT throughout the UAE has complemented, if not induced the rapid transformation of this former truncal state. Much has been written about how this wealthy nation has claimed a leading role in many sectors, both regionally and globally. The aim of this research was to explore the manner in which academia has contributed to this scenario, providing contemporary, complete education to future healthcare professionals.

6.4.1 What was previously known?

Literature search provided little evidence of the examination, exploration or evaluation of health sciences curricula in the UAE with specific focus on integration of HI theory and application. Extensive literature was found, both academic and grey literature, addressing the implementation of HI in the UAE health sector. Healthcare facilities have invested heavily in HI in pursuit of the nation’s goal to provide “global leadership in healthcare” (UAE MoHAP, 2020, p. 1). Notably absent from these discussions was any mention of how academia would receive or provide support to facilitate these endeavours.

National HI associations have been formed in affiliation with international bodies such as the International Medical Informatics Association (IMIA). Statements of vision, mission and strategic objectives, as is standard practice, addressed current and future goals of this organization within the health sector. Again, notably absent was any explicit reference to a partnership with the academic sector (Emirates Health Informatics Society [EHIS], 2020).

In essence, this lack of published information specifically acknowledging academia's roles and responsibilities within the HI framework is precisely the problem. The UAE has the unique opportunity to examine global HI implementations, gain knowledge from both successful and unsuccessful projects, thus design and deliver a 'world class' health information and communication system. However, a dearth of literature exists to provide evidence this opportunity has been taken. Perhaps it is worth considering that this scenario within the UAE mimics that of many developed countries that followed a similar path. It is this very scenario that exemplifies the impetus for this research.

6.4.2 What this study adds

This research did confirm findings discussed in the literature review. However, significant findings from this project highlight the notable impact of people coming together to discuss this concept in a familiar, non-threatening environment. There are several implications associated with this outcome, which are discussed here:

- Providers and consumers of HI education require more opportunities for open dialogue. Interoperability is the very essence of HI. It would therefore seem prudent to involve representation from all stakeholder groups in curriculum development. The collaborative, open discussions of the focus groups are an example of the impact of effectiveness of communication and opportunities to share best practice. Evidence of this can be found in the Findings section *4.1 Communication*.
- Health professions education requires more focus on systems thinking to ensure students and graduates fully comprehend healthcare as a system. This would enhance awareness of their salient role within that system as well as providing a broader understanding of the needs of their customers and partners. These findings are discussed in section *5.4 Preparedness for*

Health Informatics, which can be found in Chapter 5 – Discussion. The concept of systems development lifecycle is also described in section *2.11 International Variance in HI Implementation and Education in Various Health Systems.*

- The UAE health sector has transitioned from a publicly funded system, to a privately funded system, and subsequently to its own salient combination of public-private funding, to establish its healthcare system. This scenario has complicated academia's ability to identify general and targeted needs of its stakeholders, and in turn develop curricula that align with these needs. Knowledge of these evolving components within the UAE healthcare system and their impact on current and future healthcare professionals could provide valuable guidance to those responsible for curriculum development. Plans to address this are discussed in section *5.5 Future Plans Pertaining to Health Informatics* and is summarized in Table 13: Providers' Future Plans Regarding Health Informatics.
- As one Alumni participant noted, "physicians are only able to learn and apply HI from another physician." This seemingly pragmatic concept was demonstrated repeatedly in focus groups wherein participants from a specific program shared insights that informed and educated colleagues. The recommendation to restructure teaching and learning strategies to reflect this requires further investigation. Healthcare professionals and educators are often criticized for operating in silos; the potential for this recommendation to reinforce this characteristic exists and merits further study. Further evidence of this concept can be found in discussions of curriculum in *4.4.3 Future Plans*.

This research revealed developments that are possibly unique to the UAE, and therefore provide new insight regarding the status of HI curricula. The rate at which technology has been implemented in other sectors of the UAE, specifically commerce and health, has reportedly been very rapid – as is characteristic of the UAE. In the health sector, it is conceivable this rapid, possibly forced, adoption has resulted in low acceptance of technology. Furthermore, it is possible this level of adoption has transferred to the academic sector by means of the ‘practitioner-academic’ scenario as well as from student and alumni experiences with technology during clinical placements. It is not safe to assume that high rates of adoption equate to high rates of acceptance or competence. While this scenario could exist in developed countries, the rapid evolution of this country presents a unique perspective through which to examine HI curricular needs and development. This concept is discussed in detail in section *2.11.3 HI Implementation and Education in the UAE.*

Findings of this research indicate Emiratis lack confidence in their nation’s healthcare system. This finding concurs with evidence published in earlier literature. The suggestion that this practice continues, in spite of the concerted efforts to bring the UAE health system into the 21st century, is significant and contributes to knowledge gained as a result of this study. Evidence of this was found in student and alumni discussions wherein families continue to access healthcare abroad. This concept should be incorporated into health professions education in the UAE, as this is a significant and unique factor of its healthcare system. This also presents as an opportunity for the academic sector to explore this development, to determine how HI might serve to mitigate this and incorporate key findings in teaching and learning strategies. As discussed, the government has explicitly stated the goal to establish a world-class healthcare system. It is unclear how this could proceed without an educational framework to support this structure. Elaboration of these findings can be found in *1.2.10 Concepts Driving Innovation in the Health and Academic Sectors in the UAE.*

Three core themes were selected to guide this investigation: participant perceptions of and preparedness for HI, as well as future plans pertaining to HI. As a result of this research, four sub-themes emerged that were notably prevalent amongst focus groups, specifically issues pertaining to communication, confidence, responsibility and curriculum. Until such time that these four concepts are addressed it is unlikely perceptions of or preparedness for HI will change, which in turn impacts any future plans involving this subject area in academia. This knowledge refers back to the unexpected yet significant benefit of people coming together, joining in dialogue to develop a common mission and strategic objectives. Ultimately, this opportunity to communicate and collaborate bolsters one's confidence in their own knowledge and competence, as was witnessed repeatedly in this project. Also, as a result of this opportunity to communicate, knowledge of responsibilities was renewed and/or enhanced. This investigation revealed a hesitancy to assume responsibility, a consequence that might be explained by the initial ambiguous perception of HI and its relationship to each salient health profession. This knowledge would provide structure and guidance to those tasked with curriculum development, having identified and discussed gaps as well as sustainable long-term solutions. Section *4.3 Responsibility* discusses the concept of responsibility including participant perception and acceptance.

Another factor contributing to the uniqueness of this research is its participants. Investigations incorporated four different perspectives thus offering a wide scope of perceptions regarding HI. Also, as most professionals in the UAE academic sector are expatriates representing more than 40 nations, academic management and faculty perspectives provided a distinctively global representation. The potential of this knowledge to impact benchmarking and decision-making pertaining to curriculum design is significant. Details of the study population and setting can be found in *1.3 Research Background.*

This research focused on preparedness of the future healthcare workforce, rather than on the current workforce, a theme commonly found in literature review. Involving students and alumni provided the unique opportunity to understand their HI journey, navigating both the health and academic sectors. These two groups of participants collectively referred to as Consumers in this study, readily identified gaps in curriculum and training, and followed this with thoughtful, pragmatic suggestions to resolve this for future students of health. This information reinforces the need to establish an enhanced focus on the future healthcare workforce. Evidence of these suggestions may be found throughout Chapter 4 – Findings where Consumer perceptions, opinions and recommendations are discussed in detail.

6.5 Status of HI Implementation in the UAE

Since leaving the UAE, I have maintained contact with many of the focus group participants and have been encouraged to learn plans are underway to incorporate IMIA guidelines in the design of HI curriculum. This remains in early planning stages with faculty representing all health science programs collaborating to design core informatics curriculum. Access to informatics applications has been included in this strategic planning. Enlisting the model used by the Nursing program (see Section 6.1) whereby students receive training on their salient informatics modules at the hospital setting, delivered by their experts has been incorporated in all health science programs at the college. Supporting curriculum with informatics applications in the college setting remains in the planning stage as an academic EHR has not, as yet, been made available. I have shared the knowledge and experience gained as I proceed with collaborative efforts to design, implement and maintain the academic informatics resource here in Canada.

In the ensuing years, associations such as the EHIS have engaged in collaborations with regional and international organisations to establish an HI infrastructure addressing the diverse needs of this nation’s Emirati and expatriate population. The main partners are the Saudi Arabian Health Information Management Associates (SHIMA, n.d.) and International Federation of Health Information Management Associations (IFHIMA, n.d.). The latter group consists of global representation of health information management expertise and have recently established global health information management/health informatics learning outcomes for use by all member constituents. An alumni participant of this research is a member of the IFHIMA sub-committee tasked with developing these learning outcomes and has assumed a lead role in supporting curriculum development in the UAE.

6.6 Suggestions for Future Research and Current Research Agenda

Opportunities for future study, including exploration of each phase of strategic and operational planning of this academic resource and related curriculum are recommended. Lessons learned would provide valuable guidance to academic institutions finding themselves in a similar setting. Fortunately, the basic premise of health care is universal. Accordingly, the requirements of academia should similarly be seen as universal. Sharing knowledge and resources on an international platform is both possible and highly recommended.

I have recently embarked on a new research project focusing on the global pandemic, COVID-19 and the impact this has had on faculty and students within the health science division. A methodology of photo-voice has been adopted, inviting participants to share their experiences visually, with photos, or in narrative form. Embedded in this research is the exploration of how technology, specifically health informatics applications, has been utilised to communicate experiences pertaining to teaching and learning in this modified academic structure.

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Appendices

Appendix A – Research Proposal

UNIVERSITY OF BATH

SCHOOL FOR HEALTH

Professional Doctorate in Health

Student Name:	Patricia Visosky
Date submitted:	January 3, 2014
Word Count:	9145
Unit name:	Unit 8
Assignment name:	Research Project Design and Development
Tutor's name:	Doctor David Wainwright

Declaration:

I certify that I have read and understood the University Regulations relating to plagiarism available at http://www.bath.ac.uk/learningandteaching/cop/qastatements/QAX/QA53.pdf. All the material in this assignment is my own work, except where I have indicated with appropriate references. I understand that my work will be submitted to the University's Plagiarism Detection Software service for checking.

Comments on any unusual/mitigating circumstances:

Table of Contents

Table of Appendices

Introduction:

This portfolio provides information detailing my proposed research. My area of interest is health informatics. As a member of the health science faculty I am concerned with the knowledge and skills provided to graduates of our clinical and allied health programs. The focus of my study will be to gain an understanding of stakeholders' perceptions and current knowledge relating to health informatics. It is anticipated this information will be beneficial in future development of health informatics curricula for programs offered at the college here in the United Arab Emirates.

The portfolio is divided into the following sections:

- Section A: Research Protocol (Word Count: 4594)
- Section B: Research ethics proposal (Word Count: 815)
- Section C: Discussion of Learning Needs Analysis and Personal Development Plan (Word Count: 980)
- Section D: Summary statement describing my development as a researcher (Word Count: 1031)
- Section E: Reflective commentary of my progress during Phase Two of my doctoral studies. (Word Count: 1735)

Appendices have been included at the conclusion of the portfolio. Reference is made to these appendices through each Section, as appropriate.

Section A

Research Protocol

School for Health

Title of the Project
Understanding stakeholder perceptions and knowledge of health informatics in clinical and allied health programs in the United Arab Emirates (UAE).

Summary of the Project
Application of health informatics in curricula at Higher Colleges of Technology (HCT) in the UAE is essentially non-existent. A study of stakeholder knowledge, perception and acceptance of health informatics will facilitate understanding of how successfully health informatics curricula may be integrated into the college network.

PROJECT PROTOCOL

Purpose of Research – Research Question/Hypothesis

Purpose of Research:

The purpose of this research is to determine stakeholder's perceptions and knowledge of health informatics, pertaining to development and integration of biomedical/health informatics curriculum. This study will identify differences in perceptions between various stakeholders, as this may enhance a contextualized understanding. The research will seek to determine what impact these differences in perceptions may have on development of health informatics curricula. Inherent in this will be exploration of the potential to mitigate any differences between and amongst stakeholders.

Research Questions:

(1) What are the perceptions of stakeholders (faculty, students, alumni, program administration) regarding an academic health informatics module?

(2) What are the barriers to and facilitators of the integration of an academic health informatics module?

Background/Introduction

This research will investigate stakeholder perception, motivation and concerns regarding health informatics, particularly, its inclusion in health science curricula. A stakeholder is described as a constituent of an organisation.[1] Accordingly, stakeholders of health informatics education are those that are affected by it.

The setting is a tertiary academic institution in the UAE. Healthcare facilities have included an electronic health information system (HIS) in their strategic and operational planning. Government hospitals utilize this electronic system; plans to integrate with private and military hospitals have commenced. It would seem prudent for academic institutions to equip its graduates with requisite skills and competencies in health informatics. Initial review of matrices indicates this is not the case. This may be due to the lack of qualified informatics faculty as Borycki et al (2011) have suggested.[8]

Higher Colleges of Technology (HCT) is comprised of a network of seventeen campuses throughout the seven emirates.[2] Clinical and allied health science programs are offered at nine campuses. Inspection of matrices and curricula revealed 'health informatics' was included in only one program. This is in complete contrast to current trends in industry suggesting the pathway to modernized healthcare delivery can only occur with the design and implementation of "sophisticated technology-based information systems".[3]

This study will examine the factors contributing to the delay in developing health informatics curriculum in Health Science programs at HCT. Such hesitancy toward application of health information technology is common. Ash reports on "adoption and diffusion rates" of health information systems, suggesting a significant gap persists.[4] Health informatics applications can be tailored to meet the needs of all health programs offered at HCT. Accordingly, attention will be paid to commonalities and differences in beliefs of stakeholders within each division. Knowledge gained from this research would facilitate the development of relevant health informatics curricula to support each specialty within the program.

Literature Review

1. Introduction

Health informatics has assumed a prominent role in the healthcare environment. Proponents assert integration of information technology in health will have a significant impact on quality and hence, costs of healthcare delivery. Empowering patients and healthcare providers with relevant, accurate information are cited as key elements contributing to these improved health outcomes.[5] Opponents counter that little evidence exists to substantiate these claims, suggesting return on this considerable investment remains elusive.[6] Academics attribute the lack of trained health faculty as one contributing factor to this deleterious result.[7] Review of literature would suggest this debate has yet to come to a satisfactory conclusion. The focus of this research project is this very debate.

2. Search Strategy

Articles from 1995 onwards addressing health, medical or biomedical informatics education, competencies and curricula were selected from the Embase, PubMed and Medline databases. Additionally, a selection of relevant articles was hand-searched by accessing the University of Bath online library and finally, Google Scholar. Academic articles discussing curriculum design, faculty perceptions, acceptance, barriers and enablers pertaining to health/medical informatics were selected for review. Literature relating to consumer, dental, veterinary informatics and revenue cycle informatics were excluded.

Key words used to search the databases were: 'health informatics', 'medical informatics', 'biomedical informatics', 'curricula', 'curriculum', 'education', 'competency', 'faculty', 'perception', 'model', 'degree', 'postgraduate', 'allied health', or 'clinical health'. The literature search was limited to English language articles published between 1995 and 2013.

3. Summary of Literature Review

3.1. Defining Health informatics

Health informatics has many designations. Medical and biomedical informatics are common labels that may be used interchangeably. In its most general sense, health informatics has been defined as "the field that is concerned with the optimal use of information, often aided by the use of technology, to improve individual health, health care, public health, and biomedical research."[8] This interpretation clearly supports the prominent status health informatics has earned. It would also explain why several factions of healthcare professionals have developed its own salient brand of informatics. Medical, nursing, pharmacy and public health informatics are examples.

3.2. Purpose of Health Informatics

The common thread connecting all patrons of health is 'information'. Legislators, policymakers, payers, educators, caregivers, patients and their community all rely on complete, accurate and current information to support critical decision-making. Health informatics has emerged in response to this basic need for valid and reliable information. The purpose and function of health informatics should be self-evident; however, Hersh claims this field of science continues to be "poorly understood and not even agreed upon by academics and professionals in the field."[11] What appears to have been a simple concept in theory has become complex and evidently poorly managed in practice.

In response to the need for health informatics education and training, Canadian researchers developed an integrated model for health informatics education and research.[9] Eight universities collaborated to assess industry's needs and accordingly develop informatics curriculum to be embedded in clinical and allied health programs. An additional outcome was the establishment of a nation-wide health informatics research program with the sole purpose of monitoring and addressing the "growing need for health informatics professionals."[12] The authors emphasize the on-going need to educate and train healthcare professionals in theory and application of this basic resource.

A systematic review focusing on the dichotomy between proclaimed benefits of health informatics and the alleged lack of academic support and infrastructure identified several contributing factors, assigning responsibility equally among the aforementioned stakeholders.[10] Diversity of this population with varying levels of health knowledge and expertise has contributed to the complexity of this scenario. Poorly written, sometimes non-existent legislature and policy were also cited. Of particular relevance to this study is the authors' investigation of the implementation cycle and how this has limited the ability to assess impact of health information technology with any degree of reliability. Research of multi-function integrated HIS, connecting every level of regional healthcare service was missing. Recommendations were made for further study of "internally" and "commercially" developed systems.

3.3. Applications of Health Informatics

Health informatics applications have developed ranging from robotic surgical assistance to the ubiquitous electronic health record. The latter is of key importance to this study. The majority of healthcare professionals will use it; Graham-Jones et al (2102) suggest that a decided minority is sufficiently educated and trained to efficiently use it.[11] Research of American medical students' exposure to electronic health records found that while the curriculum existed, students were rarely allowed to utilize this resource.[12] Anecdotally, health science students in the UAE have reported a similar situation. The impact this may have on quality of health outcomes and underpinning causal factors are a concern and will be incorporated in this research.

3.4. Policy & Standards

Establishing policy and standards, unifying government and academia, is likely to be critical to the successful uptake of this fundamental tool. The International Medical Informatics Association (IMIA) initiated this process in 2000 and more recently produced revisions to their educational recommendations in 2007.[13] IMIA Key Principles acknowledge that, "every profession in health care even at an early stage needs some core biomedical health informatics (BMHI) education."[16] This document provides a recommended pathway for academic institutions, and if followed, would achieve an international, standardized approach to health informatics tuition. These guidelines provide valuable direction to this research.

3.5. Local Health Informatics Application

Integral to the development of international standards, is the need to ensure application at the local level. Accordingly, academic institutions are advised to incorporate recommendations, such as those developed by IMIA, to ensure they appropriately meet stakeholders' needs. Benchmarking local initiatives with international best practice has been recommended to ensure IMIA's key principles are adapted correctly and effectively. McCullagh and Murray (2006) recommended benchmarking health informatics "with a focus on Computing Science".[14] Their research identifies the importance of including various academic disciplines in the development of health informatics curricula, emphasizing again the complexity of this discipline's stakeholders. This recommendation is relevant to the proposed research, as all health science disciplines within HCT are stakeholders.

Investigations into provision of standardized health informatics education and training were performed in the United Kingdom. An investment of several billion pounds (£11.6 billion) was projected in 2004 by the National Health Services addressing design and implementation of an integrated HIS.[15] This research investigated the status of health informatics curricula in clinical and allied health programs and identified barriers to successful implementation of this significant expenditure. The authors applied the standards recommended in *Learning to Manage Health Information (1999)* (NHS Information Authority in Murphy et al) and concluded compliance at both the academic and industry levels needed "more work".[20] Since that time, the *Learning to Manage Health Information* (LMHI) document has been revised (2012) ensuring its framework is relevant to the current healthcare industry.[16] Standards recommended in this document are germane to the proposed research and will be embedded in the design and methodology. Continued efforts of the NHS to monitor standards of health informatics curricula support the need for this proposed research.

Government is an influential partner in this debate. Little activity may occur without clear directives in the form of sanctioned policies. Yet, research concedes a dearth of health informatics policy exists.[17] Goldsmith et al (2003) contend that because of this lack of policy, the American healthcare system has created a health information network that is not interoperable, therefore is ineffectual and unsafe.[17] This scenario is repeated in the UAE. Senior officials of the Health Authority of Abu Dhabi (HAAD) informed the author that no such policy existed. HAAD is responsible for strategic planning of healthcare in the emirate of Abu Dhabi and collaborates with the Dubai Health Authority (DHA). This request was posed to DHA with a similar response. Findings and recommendations of this research will be shared with both administrations.

4. Conclusion of Literature Review

Initial review of literature has emphasized the need to gain contextualized understanding of perceptions held by stakeholders pertaining to health informatics. Pursuant to this is the need to explore various cognitive learning theories underpinning health informatics teaching and learning strategies. Patel et al (2009) suggest informatics academics rely on a "family of such theories or frameworks" rather than one specific learning theory to achieve comprehensive, contextualized and applicable learning.[18] Theoretical frameworks address the transfer of knowledge and skill, a crucial concept when educating future healthcare professionals. Patel advises informatics curricula be included early in the program matrix with the goal of producing graduates confident and competent in the use of informatics.

This situation does not occur in isolation but rather is a common scene played throughout global healthcare settings. This work will be an important first step towards a wider understanding regionally and internationally. The UAE, admittedly a small country, may be seen as a global representation of healthcare providers. As such, this research has the potential to provide contextual insight into the design, development and implementation of health informatics curricula to international partners.

Aim of Research

The aim of this research is to explore stakeholders' perceptions of, knowledge about and acceptance of the introduction of health informatics curriculum in health science programs at HCT.

Objectives of Research

To explore stakeholder perceptions, knowledge and acceptance of health informatics.

To understand and map any enablers and barriers to the inclusion of health informatics curriculum.

To develop a Grounded Theory pertaining to stakeholders' perceptions of health informatics curriculum.

Research Plan - Statement of methods

Methodology and Study Design:

Grounded Theory methodology has been chosen as it represents an "attempt to derive theories from an analysis of the patterns, themes, and common categories discovered in observational data."[19] The process of gaining new knowledge is not founded on theory, but will be based on data collected during focus groups and interviews. This approach allows the researcher to investigate and understand stakeholder perceptions and knowledge of health informatics from multiple viewpoints using a variety of observational techniques.[20]

Exploration of the meaning assigned to health informatics and how faculty behave or interact with this concept are best explained by the symbolic interactionism theory. Cummings and Borycki (2011) submit the meanings one attributes to things "influence how they react to these objects in their environment."[21] Symbolic interactionism, as discussed by Blumer, suggests one assigns meanings to things as a result of interactions with others, which then influences one's interpretation of that particular construct.[22] Applying this theory to the proposed research, the meaning faculty assign to technology in healthcare could be influenced by their interaction with this technology as well as interactions with their peers, all delivering them to their specific interpretation and understanding. Cummings and Borycki submit that grounded theory methodology, with its implicit relationship to symbolic interactionism, is well suited to investigations into health informatics. This theoretical framework and methodology have been selected for this research.

The research design is qualitative; this design focuses on meaning and interpretations of one's reality[23]. Inductive reasoning, which is embedded in a qualitative approach, will allow the author to gain contextualized perspective of stakeholder knowledge and perceptions. Focus groups will be scheduled with each group. Subsequent focus groups may be held to provide participants an opportunity to continue discussions. Semi-structured interviews will be conducted with participants from each group who were not included in a focus group. This will serve to confirm or disconfirm themes as they evolve from focus groups. Qualitative methods may use various modes of data collection adopting the tenet that 'truth' has various interpretations. Focus groups and interviews will attempt to capture the whole 'truth'. Through an iterative series of inductive and deductive analysis new areas of investigation will be identified; revised data collection tools will be designed and successively introduced.[24]

Focus groups are the inductive phase involving constant comparisons of coded data to support development of theory. Subsequently, more focused interview questions will be designed for use during deductive phases.

This methodology establishes theory where such constructs do not exist. Therefore, a control group would serve no purpose. Theoretical sampling will be used to select participants who may provide contextualized insight, with the goal of establishing a theory.

How does the study design deal with minimising biases:

Literature suggests the terms 'reliability' and 'validity', while requisite components of quantitative study, should more appropriately be redefined as 'credibility', 'applicability' and 'consistency' when used in reference to qualitative research.[25]

Reliability:

Transcripts will be monitored closely to ensure they contain no mistakes. The coding system will be well defined to minimize any potential to misinterpret the code meaning. A cross-checking system will be developed in collaboration with a researcher from another academic institution in the region.

Triangulation:

Methodological triangulation will involve the use of a combination of qualitative methods (focus groups and interviews). Findings from focus groups within and across participant groups will be compared to determine if any similarities exist, serving to establish validity. Member checking will be employed, asking participants to review a summary of findings, indicating accuracy. A second researcher will be invited to review the discussion items and questions, and ultimately the findings and to critically review the analysis.[28]

Reflexivity

The researcher is academic lead faculty with a Masters of Science in Health Informatics. The researcher has a keen interest in ensuring curriculum is relevant, current and appropriate. This information is offered to clarify bias the researcher brings to this study. Golafshani suggests credibility of qualitative research "depends on the ability and efforts of the researcher."[25] The interpretation of findings will necessitate careful consideration of both the phenomenon studied as well as the researcher's assumptions and past experiences. Reflections and memos will be documented routinely. This practice of reflexivity will also serve as an audit trail, providing an opportunity to convert the researcher's thoughts and assumptions into text, facilitating further evaluation and action.

Reliability is achieved when an "accurate representation of the population"[26] is consistently produced over time. A qualitative approach involving focus groups and interviews will be used to ascertain faculty beliefs, knowledge, and motivation relating to use of health informatics curricula. A well-defined coding system will allow analysis and interpretation of information collected.

Participants:

Stakeholders involved in health informatics throughout various stages of teaching, learning and application hold information and knowledge of key importance to this research. Accordingly, four principal groups have been identified as the strategic population for inclusion: health science teaching staff, academic management, students and alumni.

Faculty has a responsibility to provide current, relevant tuition. Literature contends the "importance of health informatics as a tool – indeed a unifying mechanism – within health care is now globally self-evident."[27]

Health science students have a responsibility and an expectation to be well versed in health informatics theory and application

Alumni employed in healthcare are also key stakeholders. Gaining insight into their experiences may provide valuable detail and context into the need for prior health informatics education and training. Alumni will be sub-divided into those who have received health informatics tuition at HCT and those who have not.

Academic management determines organisational culture within which teaching and learning takes place. Westrum describes three types of organizations; pathological, bureaucratic and generative submitting that performance is directly influenced by organisational culture.[28] It is essential to gain a clear understanding of this group's views on health informatics and its role in academia.

Participants will be recruited from nine campuses. Each participant group will be approached sequentially, beginning with teachers, academic management, students, and concluding with employed alumni.

Sampling

Literature suggests theoretical sampling is a central tenet of grounded theory and is "essential to the development and refinement of a theory that is grounded in data."[29] Theoretical sampling will therefore be used. Other research recommends the use of a combined sampling procedure to support comprehensive collection of richly detailed information. Selective sampling techniques are required at the initiation of the study to identify specific participant groups; theoretical sampling is subsequently introduced once theories begin to emerge from collected data.[30] Draucker et al (2007) contend that knowing when to transfer from selective to theoretical sampling may become complicated. Accordingly, the authors designed "The Theoretical Sampling Guide." This Guide will be adapted to support the sampling process inherent in this proposed research project to facilitate this transition (Appendix A).

Selective sampling strategies for each participant group are detailed here. Potential theoretical sampling methodologies will be discussed at the appropriate phase of the project. Literature suggests there is little consensus on quantity of the sample but rather on quality and richness of the data, suggesting a sample size of ten to thirty is sufficient.[31] The sample size must be adequate to produce enough data to facilitate generalization of knowledge gained. Discussions of sample size and strategies for each participant group as well as recruitment strategies are specified below.

1. Teaching Staff

Health Science teaching staff at HCT is a diverse collection of healthcare professionals with varying degrees of teaching experience. There are fifty-six teaching faculty. A sample of fifteen faculty would be sought; ten scheduled for focus groups and the remaining five invited to interviews. A sample of fifteen participants will be randomly selected from those that volunteer to participate. Due to geographic distances, a combination of face-to-face and virtual meetings using Zoom or Google+ would be arranged (Appendix B).

2. Academic Management

There are five program supervisors and two academic deans responsible for managing the Health Science division of HCT. This small number represents a homogeneous group of academics with extensive healthcare and teaching experience. All members would be invited to participate in a focus group.

3. Health Science Students

There are over four hundred students enrolled in various Health Science programs throughout HCT. A sample of ten students from each program will be contacted, allowing for participation from both clinical and allied health areas. Two volunteers from each program would then be selected randomly, for a total of eighteen student participants. Ten students will be assigned to focus groups; eight students will be scheduled for interviews.

4. Alumni

Alumni will be divided into two groups: those who have had some form of health informatics tuition and those who have not.

Grounded theory research submits a small sample size of ten to twelve is appropriate when dealing with a homogeneous group of participants, such as 'Alumni'. [32] Eligible participants will have graduated from a health science program at HCT within the past ten years. A list of employed graduates will be requested from the Student Services Department. The researcher may determine if the graduate received health informatics tuition according to the year of enrolment and review of matrix.

A sample size of sixteen alumni is the goal. Ten participants will be invited to attend focus groups. This section of the participants will consist of five employed alumni who had some health informatics tuition and five employed alumni who did not. The remaining six alumni will be requested to participate in an interview. The candidates will be selected randomly from the relevant list.

Recruitment:

The research would be introduced to teaching staff and academic management at a regularly scheduled Health Science Division meeting (which all faculty attend) and volunteers sought. An email will be sent to potential student and alumni participants, including an introduction to the project and an invitation to contact the researcher if they wished to participate. Focus groups and interviews will be arranged (Appendix Q). Information packages will be given to potential participants for their consideration (Appendices C, E, G, I, K, M, O) and consent will be taken prior to the focus groups and interviews (Appendices D, F, H, J, L, N, P).

Setting:

HCT in the UAE is the setting. Health Science programs are taught at nine campuses. Initial focus groups will occur in person at one campus. Virtual contact using online conferencing will be used when deemed appropriate. Research indicates this new forum may be beneficial, providing participants with a more comfortable environment where dialogue is "candid and insightful". [32] The participants, all stakeholders of formal and online tuition, are allegedly adept in the use of technology. Ethical considerations including privacy have been described as "no more hazardous than those associated with conventional methods" (Pittenger in Fox et al, 2007).

Data Collection:

Teaching Staff: Data collection will begin with faculty focus groups according to the plan (Appendix Q). The Health Science division meets monthly. Two focus groups consisting of five teachers will be held at the conclusion of a division meeting. The remaining five teachers will be invited to an interview, scheduled once focus groups have concluded. Focus groups will last for approximately thirty minutes.

Academic management: The academic management focus group will be scheduled at subsequent divisional meetings. One session is planned with this group; no interviews are planned.

Health Science Students: Three focus groups are planned for the student group, consisting of four participants each. The sessions will be scheduled during the remaining months of the academic year. The meetings will be scheduled for thirty minutes. Semi-structured interviews will be organized with the remaining eight student participants.

Alumni: Alumni focus groups will be tentatively scheduled June through September 2014. Two meetings are planned, one session with five alumni having health informatics tuition and one session of five alumni without informatics tuition. Each meeting will last thirty minutes. The remaining six alumni will be interviewed.

Discussions in each focus group will proceed according to the Focus Group Guide (Appendix R). A summary of discussions will be sent to its members for review and feedback. Indicative areas for future discussion will be identified and subsequent interview questions created. Interviews will address potential topics outlined in Interview Guide (Appendix S). Specific interview questions will be developed as data is collected, coded and analysed. There must be fluidity between focus groups and interviews, the process dictated by themes and indicative areas of interest.

Discussions during interviews and focus groups will be recorded for transcription, coding and interpretation at the conclusion of each session (Appendix B). Virtual meetings will be documented using both video and audio recording. Permission to use audio and/or video recording will be sought at the initiation of the project; participants will be reminded that all conversations are recorded.

Data Analysis:

At the conclusion of each session recordings will be transcribed then coded. Grounded theory research uses three phases of coding through which data is processed, analysed and themes identified.[29] The three types of coding are: open, axial and selective. Open coding initiates the process and involves detailed examination of the transcribed report identifying potential themes or concepts. The identified themes will then be sorted into general categories. Next, axial coding occurs where categorized data are analysed to determine if any explicit categories of data may be identified. Concluding the process, selective coding assesses the categorized data with a view to integrating this within a specific theoretical context.

This series of events will take place within each of the four participant groups. At the conclusion of each session the coding process ensues, potential theoretical frameworks determined and subsequent interview questions developed surrounding emerging themes and theories. Knowledge gained from meetings with one participant group may lead to revised topics for discussion at subsequent sessions with remaining participant groups. This process will be repeated with each participant group. This process of data collection, coding and interpretation will continue until the point of saturation when no new themes or categories are detected. At this point, a theory may be developed based on stakeholder perceptions of health informatics and its relevance to academia.

Ethics: (See Section B)

Outcomes and possible implications of study

The primary outcome will be an enhanced, contextualized understanding of stakeholder perceptions of the role of health informatics in healthcare and consequently the need for its inclusion in academia. This will lead to an appreciation of barriers and facilitators that exist and which must be addressed prior to development of relevant curricula.

Health informatics applications exist in both clinical and allied health professions, each with the envisioned goal of improving health outcomes. The current trend in healthcare is moving toward a prospective model of care. Health informatics lends itself well to this model. As the UAE pursues a leading role in this industry it is imperative that health informatics curriculum concomitantly keeps pace with this pursuit. Revising curricula to include contemporary health informatics tuition will support the college as it works to produce qualified, skilled healthcare professionals.

Dissemination

Findings will be shared with professionals involved in the education and curriculum development in Health Sciences programs. A summary of findings will be posted on the Health Science portal, accessible in all colleges. Presentations and papers will be presented at regular Divisional Academic Team meetings. Results will be shared with Health Science programs in other regional academic settings in the form of articles and presentations.

Publications will be submitted to peer-reviewed international journals in the field of health informatics.

Section B

Research Ethics Proposal

Section B: Application for Research Ethics Approval

Summary of Ethics Approval Process:

The purpose of this research is to determine stakeholder's perceptions and knowledge of health informatics, specifically as it pertains to the development and integration of biomedical/health informatics curriculum. This group has been identified as: health science faculty, students, academic management and alumni. All stakeholders have an affiliation with the Higher Colleges of Technology (HCT). Application for research ethics approval will be sought through the Research Ethics Review Board of HCT. This committee meets each month at which time the required documentation is reviewed. The researcher may be invited to attend a portion of the meeting if clarification is required.

Documentation required by the Research Ethics Review Board is the research proposal, a summary identifying potential participant groups, their roles and responsibilities. The Board will require evidence addressing confidentiality, anonymity and security of collected data. These elements are addressed in the research proposal, a summary of which will be included to highlight essential information.

To prepare for this process, the researcher arranged meetings with the chairman of the Ethics Review Board. Required documentation and essential elements for inclusion have been discussed. The Higher Colleges of Technology has no checklist of requirements to guide researchers in the ethics approval process and it was therefore difficult to be sure if all mandatory documentation had been collected for submission. To date, no problems have been encountered at the HCT level.

Securing ethics approval to approach alumni has required extra consideration by the HCT Ethics Review Board. Initially, it was not clear if ethical approval should be requested from their employer as well as HCT. However, the chairman of the Ethics Review Board has determined that as this group is being approached through their affiliation with HCT, consideration for ethics approval should come from this body. As a matter of professional courtesy, the researcher will discuss this with members of the Research Council of Health Authority of Abu Dhabi. Discussion and interview topic areas will be shared with the Council and evidence of their acceptance/approval will be requested.

Plan:

Participants will be given an information sheet which will introduce them to the research project and which will explain what their participation would involve. Participants will be asked to sign a consent form at this stage, indicating their agreement to participate in the research.

Focus group participants will be assured all discussions and the researcher will manage transcripts in complete confidence. All templates, coding systems and documentation planned for use in the process will be shared with participants at the outset. Participants will be reminded their involvement is voluntary and that they are able to withdraw from the study at any point.

Transcripts of recorded interviews will be kept and stored electronically. All data will be treated in a confidential manner. All identifying information (such as names of people and colleges) will be removed after the transcription.

Data will be stored using an external storage device to be attached to the author’s tablet in the college setting. The data will further be backed up on the author’s personal laptop computer and will be password protected. All hardcopy and softcopy documentation will be stored securely in the Research and Ethics Board office.

The HCT has provided the author with an iPad and tablet for personal use. Safe storage of data will be ensured by routinely backing up all information collected.

Lessons Learned: Through the process of completing the research proposal and dialogue with my supervisors, I have become more aware of details embedded in the ethics approval process. In particular, defining plans to minimize biases has introduced me to techniques not yet considered. Specifically, the practice of reflexivity was studied. Literature review suggested such practice also serves as an audit trail, providing an opportunity to convert my thoughts and assumptions into text, thereby facilitating further evaluation and action. Therefore, plans to routinely document in a journal following focus groups and interviews have been included in my research proposal. What appears to be a fairly simple task could produce much valued information and assistance in the research process. As I am a faculty member at HCT, it is essential that I declare this bias and maintain constant focus on the two roles I will be assuming. This reflective journal will facilitate such focus and as such is of critical importance.

A second outcome of this ethical approval process has been an increasing improvement in my ability to discuss and defend my research topic. As I meet with experts in the field of research to discuss ethical considerations I have had to answer numerous questions about my project: the purpose, the aim, the methodology, the design and more. Initially, this was done with some hesitation but as I am required to discuss and defend, I have gained confidence in the planned research and conversations reflect this. Also, areas requiring further attention have become apparent and the learning cycle continues.

Appendix B – Research Schedule

	Research Schedule – Patricia Visosky																		
	Sept 2014	**Oct 2014**	**Nov 2014**	**Dec 2014**	**Jan 2015**	**Feb 2015**	**Mar 2015**	**Apr 2015**	**May 2015**	**Jun 2015**	**Jul 2015**	**Aug 2015**	**Sept 2015**	**Oct 2015**	**Nov 2015**	**Dec 2015**	**Jan 2016**	**Feb 2016**	**Mar 2016**
Submit proposal to Univ. of Bath (completed)																			
Submit request for Ethics Approval (Univ. of Bath)																			
Submit request for Ethics Approval - HCT																			
Focus group – Faculty																			
Focus group – Academic Mgmt.																			
Focus group – Student																			
Focus Group – Alumni																			
Transcribe and distribute to participants for feedback																			
Transcribe data																			
Code data																			
Analyse data																			
Discuss focus group summary with supervisors																			
Determine sub-themes for core categories from data																			
Determine need for subsequent focus groups																			
Write dissertation																2016 - 2018			
Submit chapters for review with supervisors																2016 - 2018			
Finalize dissertation																			2018

Appendix C – Information Package – Academic Management

Participant Information Sheet – Focus Group
Health Science Academic Management

Study title: Understanding stakeholder perceptions and knowledge of health informatics in clinical and allied health curricula in the United Arab Emirates

You are being invited to take part in a research study. Before you decide whether or not to take part, it is important for you to understand why the research is being done and what it will involve. Please read the following information carefully. If there is anything that is not clear, or if you would like more information, please contact us. Take time to decide whether or not you wish to take part.

What is the purpose of the study?

This study aims to explore stakeholder's perceptions and knowledge of health informatics, specifically as it pertains to the development and integration of biomedical/health informatics curriculum. Stakeholders have been identified as teaching faculty, academic management, students and employed alumni of the Health Science programs of the Higher Colleges of Technology (HCT). The study will aim to identify any differences in perceptions between the various stakeholders and to determine what impact this will have on the development of health informatics curricula.

Why have I been approached?

You have been approached because you are seen as a key stakeholder in the education of future healthcare professionals.

Do I have to take part?

It is up to you to decide whether or not to take part. If you do decide to take part you will be asked to participate in a focus group. If you decide to take part you are still free to withdraw at any time without giving a reason.

What will happen to me if I take part?

If you decide to participate, you will be asked to join six Health Science academic managers from HCT in focus group discussions about health informatics. The focus group will take place at the conclusion of Health Science Division meetings and should last approximately one hour. You will be asked to sign a consent form at the beginning of the meeting. One focus group is planned. The sessions will be audiotaped. After being transcribed and analysed, the tapes will be destroyed. All identifying information will be removed to ensure anonymity. A summary of the focus group will be sent for your review and feedback.

What are the possible benefits of taking part?

While there is unlikely to be any direct benefit to taking part in this research, some individuals value being able to explore their experiences in a confidential setting. However, we do hope that the results of this research will help to inform policy and practice regarding the development of health informatics curricula for clinical and allied health science programs.

What if I wish to make a complaint?

If you wish to complain or have any concerns about any aspect of the way you have been approached or treated during the course of this study Patricia Visosky would be very happy to discuss this with you. In the event that this does not resolve your complaint then Doctor Fiona Fox is available to take the matter further. Their contact details are provided at the end of this document.

Will my taking part in this study be kept confidential?

Your focus group data will be anonymous, will be securely stored and it will remain confidential. No identifiable information will be reported. Others in the group will hear what you say and it is possible that they could tell someone else. Because we will be talking in a group, it is not possible to promise that what you say will remain completely private, but will ask that you and all other group members respect the privacy of everyone in the group.

What will happen to the results of the research study?

After all focus groups are completed and transcribed they will be analysed for common themes. The findings will be published in academic health informatics and qualitative research journals. You can request to be sent an outline of the results.

Who is organising and funding the research?

The study is being organised by Patricia Visosky, a doctoral researcher from The University of Bath. The research is funded by Patricia Visosky.

Who has reviewed the study?

The study was reviewed for scientific integrity by the Research Ethics Advisory Committee for Health at The University of Bath and the Research Ethics Committee of the Higher Colleges of Technology, United Arab Emirates.

Contact for further information

If you require any further information about the project or have any questions that you would like answered please contact Patricia Visosky at [telephone number] or [email address] Please contact Doctor Fiona Fox at [email address] if you wish to register a complaint.

Appendix D – Information Package – Faculty

Participant Information Sheet – Focus Group
Health Science Faculty

Study title: Understanding stakeholder perceptions and knowledge of health informatics in clinical and allied health curricula in the United Arab Emirates

You are being invited to take part in a research study. Before you decide whether or not to take part, it is important for you to understand why the research is being done and what it will involve. Please read the following information carefully. If there is anything that is not clear, or if you would like more information, please contact us. Take time to decide whether or not you wish to take part.

What is the purpose of the study?

This study aims to explore stakeholder's perceptions and knowledge of health informatics, specifically as it pertains to the development and integration of biomedical/health informatics curriculum. Stakeholders have been identified as teaching faculty, academic management, students and employed alumni of the Health Science programs of the Higher Colleges of Technology (HCT). The study will aim to identify any differences in perceptions between the various stakeholders and to determine what impact this will have on the development of health informatics curricula.

Why have I been approached?

You have been approached because you are seen as a key stakeholder in the education of future healthcare professionals.

Do I have to take part?

It is up to you to decide whether or not to take part. If you do decide to take part you will be asked to participate in a focus group. If you decide to take part you are still free to withdraw at any time without giving a reason.

What will happen to me if I take part?

If you decide to participate, you will be asked to join three to four other Health Science teaching faculty from HCT in focus group discussions about health informatics. The focus group will take place in one of two possible formats: face-to-face meetings or online meetings using Zoom or Skype software. The focus group meeting should last approximately one hour. You will be asked to sign a consent form at the beginning of the meeting. One focus group is planned. The sessions will be audiotaped. After being transcribed and analysed, the tapes will be destroyed. All identifying information will be removed to ensure anonymity. A summary of each focus group will be sent for your review and feedback.

What are the possible benefits of taking part?

While there is unlikely to be any direct benefit to taking part in this research, some individuals value being able to explore their experiences in a confidential setting. However, we do hope that the results of this research will help to inform policy and practice regarding the development of health informatics curricula for clinical and allied health science programs.

What if I wish to make a complaint?

If you wish to complain or have any concerns about any aspect of the way you have been approached or treated during the course of this study Patricia Visosky would be very happy to discuss this with you. In the event that this does not resolve your complaint then Doctor Fiona Fox is available to take the matter further. Their contact details are provided at the end of this document.

Will my taking part in this study be kept confidential?

Your focus group data will be anonymous, will be securely stored and it will remain confidential. No identifiable information will be reported. Others in the group will hear what you say and it is possible that they could tell someone else. Because we will be talking in a group, it is not possible to promise that what you say will remain completely private, but will ask that you and all other group members respect the privacy of everyone in the group.

What will happen to the results of the research study?

After all focus groups are completed and transcribed they will be analysed for common themes. The findings will be published in academic health informatics and qualitative research journals. You can request to be sent an outline of the results.

Who is organising and funding the research?

The study is being organised by Patricia Visosky, a doctoral researcher from The University of Bath. The research is funded by Patricia Visosky.

Who has reviewed the study?

The study was reviewed for scientific integrity by the Research Ethics Advisory Committee for Health at The University of Bath and the Research Ethics Committee of the Higher Colleges of Technology, United Arab Emirates.

Contact for further information

If you require any further information about the project or have any questions that you would like answered please contact Patricia Visosky at [telephone number] or [email address]. Please contact Doctor Fiona Fox at [email address] if you wish to register a complaint.

Appendix E – Information Package – Student

Participant Information Sheet – Focus Group
Health Science Student

Study title: How do we prepare the next generation of health professionals for the revolution in health care informatics?

You are being invited to take part in a research study. Before you decide whether or not to take part, it is important for you to understand why the research is being done and what it will involve. Please read the following information carefully. If there is anything that is not clear, or if you would like more information, please contact us. Take time to decide whether or not you wish to take part.

What is the purpose of the study?

This study aims to explore stakeholder's perceptions and knowledge of health informatics, specifically as it pertains to the development and integration of biomedical/health informatics curriculum. Stakeholders have been identified as teaching faculty, academic management, students and employed alumni of the Health Science programs of the Higher Colleges of Technology (HCT). The study will aim to identify any differences in perceptions between the various stakeholders and to determine what impact this will have on the development of health informatics curricula.

Why have I been approached?

You have been approached because you are seen as a key stakeholder in the education of future healthcare professionals.

Do I have to take part?

It is up to you to decide whether or not to take part. If you do decide to take part you will be asked to participate in a focus group. If you decide to take part you are still free to withdraw at any time without giving a reason.

What will happen to me if I take part?

If you decide to participate, you will be asked to join three or four other Health Science students from HCT in focus group discussions about health informatics. The focus group will take place in one of two possible formats: face-to-face meetings or online meetings using Zoom or Skype software. Focus group meetings should last approximately one hour. You will be asked to sign a consent form at the beginning of the meeting. One focus group is planned. The sessions will be audiotaped. After being transcribed and analysed, the tapes will be destroyed. All identifying information will be removed to ensure anonymity. A summary of the focus group will be sent for your review and feedback.

What are the possible benefits of taking part?

While there is unlikely to be any direct benefit to taking part in this research, some individuals value being able to explore their experiences in a confidential setting. However, we do hope that the results of this research will help to inform policy and practice regarding the development of health informatics curricula for clinical and allied health science programs.

What if I wish to make a complaint?

If you wish to complain or have any concerns about any aspect of the way you have been approached or treated during the course of this study Patricia Visosky would be very happy to discuss this with you. In the event that this does not resolve your complaint then Doctor Fiona Fox is available to take the matter further. Their contact details are provided at the end of this document.

Will my taking part in this study be kept confidential?

Your focus group data will be anonymous, will be securely stored and it will remain confidential. No identifiable information will be reported. Others in the group will hear what you say and it is possible that they could tell someone else. Because we will be talking in a group, it is not possible to promise that what you say will remain completely private, but will ask that you and all other group members respect the privacy of everyone in the group.

What will happen to the results of the research study?

After all focus groups are completed and transcribed they will be analysed for common themes. The findings will be published in academic health informatics and qualitative research journals. You can request to be sent an outline of the results.

Who is organising and funding the research?

The study is being organised by Patricia Visosky, a doctoral researcher from The University of Bath. The research is funded by Patricia Visosky.

Who has reviewed the study?

The study was reviewed for scientific integrity by the Research Ethics Advisory Committee for Health at The University of Bath and the Research Ethics Committee of the Higher Colleges of Technology, United Arab Emirates.

Contact for further information

If you require any further information about the project or have any questions that you would like answered please contact Patricia Visosky at [telephone number] or [email address]. Please contact Doctor Fiona Fox at [email address] if you wish to register a complaint.

Appendix F – Information Package – Alumni

Participant Information Sheet – Focus Group
Health Science Alumni

Study title: How do we prepare the next generation of health professionals for the revolution in health care informatics?

You are being invited to take part in a research study. Before you decide whether or not to take part, it is important for you to understand why the research is being done and what it will involve. Please read the following information carefully. If there is anything that is not clear, or if you would like more information, please contact us. Take time to decide whether or not you wish to take part.

What is the purpose of the study?

This study aims to explore stakeholder's perceptions and knowledge of health informatics, specifically as it pertains to the development and integration of biomedical/health informatics curriculum. Stakeholders have been identified as teaching faculty, academic management, students and employed alumni of the Health Science programs of the Higher Colleges of Technology (HCT). The study will aim to identify any differences in perceptions between the various stakeholders and to determine what impact this will have on the development of health informatics curricula.

Why have I been approached?

You have been approached because you are seen as a key stakeholder in the education of future healthcare professionals.

Do I have to take part?

It is up to you to decide whether or not to take part. If you do decide to take part you will be asked to participate in a focus group. If you decide to take part you are still free to withdraw at any time without giving a reason.

What will happen to me if I take part?

If you decide to participate, you will be asked to join three or four other Health Science alumni from HCT in focus group discussions about health informatics. The focus group will take place in one of two possible formats: face-to-face meetings or online meetings using Zoom or Skype software. Focus group meetings should last approximately one hour. You will be asked to sign a consent form at the beginning of the meeting. One focus group is planned. The sessions will be audiotaped. After being transcribed and analysed, the tapes will be destroyed. All identifying information will be removed to ensure anonymity. A summary of the focus group will be sent for your review and feedback.

What are the possible benefits of taking part?

While there is unlikely to be any direct benefit to taking part in this research, some individuals value being able to explore their experiences in a confidential setting.

However, we do hope that the results of this research will help to inform policy and practice regarding the development of health informatics curricula for clinical and allied health science programs.

What if I wish to make a complaint?

If you wish to complain or have any concerns about any aspect of the way you have been approached or treated during the course of this study Patricia Visosky would be very happy to discuss this with you. In the event that this does not resolve your complaint then Doctor Fiona Fox is available to take the matter further. Their contact details are provided at the end of this document.

Will my taking part in this study be kept confidential?

Your focus group data will be anonymous, will be securely stored and it will remain confidential. No identifiable information will be reported. Others in the group will hear what you say and it is possible that they could tell someone else. Because we will be talking in a group, it is not possible to promise that what you say will remain completely private, but will ask that you and all other group members respect the privacy of everyone in the group.

What will happen to the results of the research study?

After all focus groups are completed and transcribed they will be analysed for common themes. The findings will be published in academic health informatics and qualitative research journals. You can request to be sent an outline of the results.

Who is organising and funding the research?

The study is being organised by Patricia Visosky, a doctoral researcher from The University of Bath. The research is funded by Patricia Visosky.

Who has reviewed the study?

The study was reviewed for scientific integrity by the Research Ethics Advisory Committee for Health at The University of Bath and the Research Ethics Committee of the Higher Colleges of Technology, United Arab Emirates.

Contact for further information

If you require any further information about the project or have any questions that you would like answered please contact Patricia Visosky at [telephone number] or [email address]. Please contact Doctor Fiona Fox at [email address] if you wish to register a complaint.

Appendix G – Consent Form – Academic Management

Informed Consent Form
Health Informatics Research Project at Higher Colleges of Technology, United Arab Emirates

This informed consent form is for Health Science academic management at the Higher Colleges of Technology (HCT) in the United Arab Emirates (UAE) who I am inviting to participate in a doctoral research project, titled "Understanding stakeholder perceptions and knowledge of health informatics in clinical and allied health programs in the United Arab Emirates".

I have been invited to participate in research about health informatics in Health Science programs at the Higher Colleges of Technology.

I have read the information, or it has been read to me. I have had the opportunity to ask questions about it and any questions I have been asked have been answered to my satisfaction. I consent voluntarily to be a participant in this study

__________________________ ______________________________
Print Name of Participant Signature of Participant

____
Date (*Day/Month/Year)*

Statement by the researcher:

I have accurately read out the information sheet to the potential participant, and to the best of my ability made sure that the participant understands that the following will be done:

- Focus groups will be held where discussions will be recorded, analysed and summaries distributed to participants for feedback.

I confirm that the participant was given an opportunity to ask questions about the study, and all the questions asked by the participant have been answered correctly and to the best of my ability. I confirm that the individual has not been coerced into giving consent, and the consent has been given freely and voluntarily.

A copy of this Informed Consent Form has been provided to the participant.

_________________________ ____________________________
Print Name of Researcher Signature of Researcher

____
Date (*Day/Month/Year)*

Appendix H – Consent Form – Faculty

UNIVERSITY OF BATH

Informed Consent Form
Health Informatics Research Project at Higher Colleges of Technology, United Arab Emirates

This informed consent form is for Health Science faculty at the Higher Colleges of Technology (HCT) in the United Arab Emirates (UAE) who I am inviting to participate in a doctoral research project, titled "Understanding stakeholder perceptions and knowledge of health informatics in clinical and allied health programs in the United Arab Emirates".

I have been invited to participate in research about health informatics in Health Science programs at the Higher Colleges of Technology.

I have read the information, or it has been read to me. I have had the opportunity to ask questions about it and any questions I have been asked have been answered to my satisfaction. I consent voluntarily to be a participant in this study

________________________ ____________________________
Print Name of Participant Signature of Participant

____
Date (*Day/Month/Year)*

Statement by the researcher:

I have accurately read out the information sheet to the potential participant, and to the best of my ability made sure that the participant understands that the following will be done:

- Focus groups will be held where discussions will be recorded, analysed and summaries distributed to participants for feedback.

I confirm that the participant was given an opportunity to ask questions about the study, and all the questions asked by the participant have been answered correctly and to the best of my ability. I confirm that the individual has not been coerced into giving consent, and the consent has been given freely and voluntarily.

A copy of this Informed Consent Form has been provided to the participant.

________________________ __________________________
Print Name of Researcher Signature of Researcher

____
Date (*Day/Month/Year)*

Appendix I – Consent Form – Student

Informed Consent Form
Health Informatics Research Project at Higher Colleges of Technology, United Arab Emirates

This informed consent form is for Health Science student at the Higher Colleges of Technology (HCT) in the United Arab Emirates (UAE) who I am inviting to participate in a doctoral research project, titled "Understanding stakeholder perceptions and knowledge of health informatics in clinical and allied health programs in the United Arab Emirates".

I have been invited to participate in research about health informatics in Health Science programs at the Higher Colleges of Technology.

I have read the information, or it has been read to me. I have had the opportunity to ask questions about it and any questions I have been asked have been answered to my satisfaction. I consent voluntarily to be a participant in this study

______________________________ ______________________________
Print Name of Participant Signature of Participant

____
Date (*Day/Month/Year)*

Statement by the researcher:

I have accurately read out the information sheet to the potential participant, and to the best of my ability made sure that the participant understands that the following will be done:

- Focus groups will be held where discussions will be recorded, analysed and summaries distributed to participants for feedback.

I confirm that the participant was given an opportunity to ask questions about the study, and all the questions asked by the participant have been answered correctly and to the best of my ability. I confirm that the individual has not been coerced into giving consent, and the consent has been given freely and voluntarily.

A copy of this Informed Consent Form has been provided to the participant.

______________________________ ______________________________
Print Name of Researcher Signature of Researcher

____
Date (*Day/Month/Year)*

Appendix J – Consent Form – Alumni

UNIVERSITY OF BATH

Informed Consent Form
Health Informatics Research Project at Higher Colleges of Technology, United Arab Emirates

This informed consent form is for Health Science alumni of the Higher Colleges of Technology (HCT) in the United Arab Emirates (UAE) who I am inviting to participate in a doctoral research project, titled “Understanding stakeholder perceptions and knowledge of health informatics in clinical and allied health programs in the United Arab Emirates”.

I have been invited to participate in research about health informatics in Health Science programs at the Higher Colleges of Technology.

I have read the information, or it has been read to me. I have had the opportunity to ask questions about it and any questions I have been asked have been answered to my satisfaction. I consent voluntarily to be a participant in this study

____________________________ ____________________________
Print Name of Participant Signature of Participant

____
Date (*Day/Month/Year)*

Statement by the researcher:

I have accurately read out the information sheet to the potential participant, and to the best of my ability made sure that the participant understands that the following will be done:

- Focus groups will be held where discussions will be recorded, analysed and summaries distributed to participants for feedback.

I confirm that the participant was given an opportunity to ask questions about the study, and all the questions asked by the participant have been answered correctly and to the best of my ability. I confirm that the individual has not been coerced into giving consent, and the consent has been given freely and voluntarily.

A copy of this Informed Consent Form has been provided to the participant.

____________________________ ____________________________
Print Name of Researcher Signature of Researcher

____
Date (*Day/Month/Year)*

Appendix K – Focus Group Plan

Focus Group Schedule				
Participant Group	**Number of Focus Group Meetings**	**Number of Participants**	**Tentative Date**	**Location**
Pilot Focus Group	1	4	March 2015	On-campus meeting (All face-to-face participation)
Faculty	3	16	April 2015	On-campus and online meetings (Two sessions involved combination of face-to-face and online participation)
Academic Mgmt.	1	6	May 2015	On campus meeting (All face-to-face participation)
Students	4	21	April through June 2015	Campus site visits and online meetings (All sessions involved combination of face-to-face and online participation)
Alumni	2	10	July through September 2015	Site visits and online meetings (One session involved combination of face-to-face and online participation

- Focus groups were scheduled with faculty first.
- A faculty member from the Education Program facilitated faculty focus groups, as the participants were colleagues of the researcher
- Researcher was present to record notes and to observe.

Pilot Focus Group

Faculty who are also doctoral students from various programs, excluding Health Sciences, volunteered to participate in a pilot focus group. This provided an opportunity to stage a focus group and practice facilitating the various components from introduction through to completion and wrapping up.

Appendix L – Research Ethics Approval Committee for Health

ANNEX ONE ***Department for Health***
Research Ethics Approval Committee for Health

Checklist for all researchers

The Department for Health requires all members of staff and students who are planning research projects to consider the ethical implications of the work which they undertake. This is important in all research projects, but is ***essential*** in those projects which involve human participants.

The Department has agreed on an ethical review process which has a fast track for those projects which either do not have ethical implications and thus do not require full scrutiny, or where scrutiny will be given by another body (in particular an NHS Research Ethics Committee [REC]). Projects that fall outside of these categories will need to make a full submission to the Research Ethics Approval Committee for Health.

Name	Patricia Visosky
Project Title	Understanding stakeholder perceptions and knowledge of health informatics in clinical and allied health programs in the United Arab Emirates (UAE).

PART A: Determining the nature of your research and the route for ethical approval you need to follow (please tick the route you will follow for your ethical approval):

My research project has been successful in receiving external funding by the ESRC **(full consideration is required by the SSREC. Further details can be obtained from: http://www.bath.ac.uk/internal/research/ssrec/. For audit purposes a copy of the SSREC application & decision letter as well as this form and EIRA1 will need to be returned to the Department for Health Department Co-ordinator) (Annex 3)** ☐

My proposal is currently at the stage of application for funding (tick box)
Please complete annex 1 & 2 for REACH audit purposes. Further approval may be required once funding is approved (please refer to relevant statement below) ☐

My research project does not involve the use of human subjects **(full consideration is not required, complete the checklist and the implications form for audit purposes and return to the Department Co-ordinator; Principal investigator, second reader and researcher to sign and return to the Department Co-ordinator (Annex 2 or 3))** ☐

My research meets the requirements for submission to an NHS REC (e.g. Involves human subjects, requires access to NHS patients or will be conducted on NHS premises) **(full consideration is required by the appropriate NHS REC; complete the checklist and ethical implications form for audit purposes and return to the Department Co-ordinator (Annex 2 or 3) together with the evidence of NRES approval)** ☐

My research has received approval from another department within the University of Bath or another UK University ethics committee. Complete the checklist and submit with evidence of the institutions approval, together with Annex 2 or 3 ☐

My research involves human subjects and does not take place in an NHS context **(full consideration is required by REACH (Annex 2 or 3 and Annex 4))** ☐

My research involves human subjects and takes place outside of the UK, and for which particular consideration needs to be given

(full consideration is required by REACH - Annex 2 or 3 and Annex 4)) X

My research involves working with children and/or vulnerable adults
(a CRB check may also be required in addition to the above) ☐

My research involves the collection and storage (not destroyed on day of collection) of human tissue. (Full consideration from an NRES approved committee is required in addition to the above) ☐

Where NHS REC approval is required, please provide details of who is sponsoring this project ☐

ANNEX TWO

Department for Health
Research Ethics Approval Committee for Health

ETHICAL IMPLICATIONS OF POSTGRADUATE RESEARCH PROJECT

Brief Title of Project	Understanding stakeholder perceptions and knowledge of health informatics in clinical and allied health programs in the United Arab Emirates (UAE)
Student	Patricia Visosky
Supervisor (s)	Doctor Fiona Fox Mr. Tim Bilham

Are there ethical implications concerned with the following general issues?

	Comments from Supervisor
Source of the funding	
What steps will or have been taken to ensure competency of the student?	
Are there any data storage issues? (including confidentiality, availability, length of storage, etc)	
Dissemination of results: 1. Are any ethical issues likely to arise? 2. Are there appropriate plans for the dissemination?	
Effect on/damage to the environment	
In which aspects of the research process have you actively involved, or will you involve patients, service users, or members of the public?	Please tick all that apply ☐ Design of the research ☐ Management of the research X Undertaking the research ☐ Analysis of results ☐ Dissemination of findings ☐ None of the above
Give details of patient, service users or public involvement, or if none please justify the absence of involvement.	Health Science faculty, students, academic deans and alumni will be invited to participate in either focus groups or interviews.

Demonstration of Ethical Considerations *To be completed by the student and supervisor. Please provide a paragraph describing the ethical issues which will need to be managed during the course of the activity. See overleaf for possible areas for consideration*	Participant groups comprised of Health Science faculty, students, alumni or academic management will be invited to discuss health informatics as it pertains to their specific roles and responsibilities. Participants will be assured all discussions will be managed in complete confidence by the researcher. Conversations occurring during focus groups will be recorded, transcribed and subsequently destroyed. The researcher cannot assure that others within the focus group will maintain confidentiality, however this will be stressed at the beginning of each focus group. Ethical approval must be obtained from the Ethics Approval Board of the Higher Colleges of Technology. This Ethics proposal will request permission to involve faculty, students, academic management and alumni in the research project.

Issues for additional consideration: (This list is indicative and is not necessarily exclusive). Please tick which categories apply to your research

	Yes	No
1. Does the study involve participants who are particularly vulnerable or unable to give informed consent? (eg children, people with learning disabilities)		X
2. Will the study require the co-operation of a gatekeeper for initial access to the groups or individuals to be recruited? (eg students at school, members of self-help group, residents of a nursing home)	X	
3. Will it be necessary for participants to take part in the study without their knowledge and consent at the time? (eg covert observation of people in non-public places)		X
4. Will the study involve discussion of sensitive topics? (eg sexual activity, drug use)		X
5. Are drugs, placebos or other substances (eg food substances, vitamins) to be administered to the study participants or will the study involve invasive, intrusive or potentially harmful procedures of any kind?		X
6. Will blood or tissue samples be obtained from participants?		X
7. Is pain or more than mild discomfort likely to result from the study?		X
8. Could the study induce psychological stress or anxiety or cause harm or negative consequences beyond the risks encountered in normal life?		X
9. Will the study involve prolonged or repetitive testing?		X
10. Will financial inducements (or other reasonable expenses and compensation for time) be offered to participants?		X

11. Will the study involve recruitment of patients or staff through the NHS? (Note: If the answer to this question is 'yes' you will need to submit an application to appropriate NHS Research Ethics Committee.)		X
12. Will the study involve obtaining or processing personal data relating to living individuals, (eg involve recording interviews with subjects even if the findings will subsequently be made anonymous)? (Note: If the answer to this question is 'yes' you will need to ensure that the provisions of the Data Protection Act are complied with. In particular you will need to seek advice to ensure that the subjects provide sufficient consent and that the personal data will be properly stored, for an appropriate period of time). Information is available from the University Data Protection Website and dataprotection-queries@bath.ac.uk	X	
13. Will the study involve the use of animals?		X
14. Does the study raise any other ethical issues which you wish to be raised and reviewed by the Research Ethics Approval Committee for Health? If yes, what are they, please expand here:		X

I confirm that the statements above describe the ethical issues which will need to be managed during the course of this research activity.

Principal Investigator/ Supervisor/Project Supervisor	**Signature:** **Date:**
Second reader (PhD/DHealth/MPhil/MD only) (This will normally be a person external to the project team)	**Signature:** **Date:**
Researcher/Student	**Signature:** [redacted] Dec. 30, 2013 **Date:**

Please submit this form to the Department Co-ordinator

ANNEX FOUR – Application form for full submission for research ethics approval

Department for Health

Title of study	Understanding stakeholder perceptions and knowledge of health informatics in clinical and allied health programmes in the United Arab Emirates (UAE)
Chief investigator Supervisors: Doctor Fiona Fox and Mr. Tim Bilham	Name: Patricia Visosky e-mail: [redacted] Telephone: [redacted]
Other investigators **(for research student projects, put students name here)** **(for undergraduate projects, put student(s) name here)**	Name: e-mail: Telephone:
Source of funding for the study	Study is to be funded by students.
Proposed dates of study	May 2014 – December 2015
Research question	1. What are the perceptions of stakeholders (faculty, students, alumni, program administration) regarding an academic health informatics module? 2. What are the barriers to and facilitators of the integration of an academic health informatics module?
Background (less than 100 words)	This research plans to investigate stakeholder perception, motivation and concerns regarding health informatics and in particular its inclusion in health science curricula at the Higher Colleges of Technology (HCT) in the United Arab Emirates (UAE). HCT is comprised of seventeen campuses situated throughout the nation; Health Science programs are taught at nine of these campuses. Cursory review of program matrices indicates little evidence of health informatics curricula in neither clinical nor allied health programs. Conversely, healthcare facilities have designed and implemented a nation-wide health information system. Equipping Health Science graduates with the requisite knowledge and skills would seem logical.
Methods (less than 300 words)	The proposed research will use grounded theory methodology. The objective of the study is to gain contextualized understanding of stakeholder perceptions and knowledge of health informatics and its relevance to their salient health

	programs. The process of gaining new knowledge, in this instance, is not founded on theory but will be based on data collected during focus groups and interviews. Knowledge gained from this sequential and recursive review within and across cases will be used in decision-making and will facilitate development of theory related to design and integration of health informatics as an academic resource. Focus groups will be scheduled with each group of stakeholders. Semi-structured interviews will be held with participants from each group who have not previously been included in a focus group. This will serve to confirm or disconfirm themes as they evolve in the focus groups. Through the constant review and comparison of data, new areas of investigation will be identified; revised data collection tools will be designed and introduced at subsequent focus groups and interviews. No control group will be used. The purpose of grounded theory methodology is to establish theory in situations where such constructs do not as yet exist. Therefore, a control group would serve no purpose in this research; it is essential that all potential end-users be given the opportunity to participate, offering continuous dialogue as part of the research process. Methodological triangulation involving a combination of qualitative methods will be established. Findings from focus groups and interviews within and across participant groups will be compared to determine if any similarities exist, serving to establish validity. Member checking will be done to describe accuracy of the findings. Participants will be asked to review a summary of findings and to indicate if the report is accurate. The researcher will keep a reflective journal.
Sample size (or equivalent qualitative approach)	Four key stakeholders have been identified: Health Science faculty, students, academic managers and alumni. A sample of fifteen faculty members will be sought; ten faculty members invited to join focus groups and five invited to be interviewed. There are seven members of the academic management and all will be invited to participate. There are more than four hundred students enrolled in the various health science programs. A sample of students from each program would be sought, aiming for a total of eighteen student participants. Ten would be assigned to focus groups; eight students would be scheduled for interview. Alumni would be divided into two groups: those who had some health informatics tuition and those who did not. A sample of sixteen alumni is the goal; ten assigned to focus groups and six to be interviewed.
Proposed Analysis	Discussions during interviews and focus grups will be recorded for transcription, coding and interpretation at the conclusion of each session. Virtual meeting will be documented using both video and audio recording. Permission to use audio and/or video recording will be sought at the initiation of the project; participants will be reminded that all conversations are recorded at each session.

	At the conclusion of each session the recordings will be transcribed then coded. Grounded Theory research proposes three phases of coding: open, axial and selective. Open coding initiates the process and involves detailed examination of the transcribed report to identify potential themes or concepts. The identified themes will then be sorted into general categories. Next, axial coding occurs where categorized data are analysed to determine if any explicit categories of data may be identified. Concluding the process, selective coding assesses the categorized data with a view to integrating this within a specific theoretical context. At the conclusion of each session the coding process ensues, potential theoretical frameworks determined and subsequent interview questions and focus group topics developed surrounding emerging themes and theories. Knowledge gained from meetings with one participant group may lead to revised topics for discussion at subsequent sessions with the remaining participant groups. This process will be repeated with each of the four identified participant groups. This process will continue until the point of saturation when no new themes or categories are detected. At this point a theory may be developed based on stakeholder perceptions of health informatics and its relevance to academia.
Potential risks to volunteers	Health science faculty may perceive their involvement to be detrimental to their continued employment. Assurance of confidential management of data, maintaining anonymity, will be given. All volunteers will be given an information sheet with detailed information addressing confidentiality and their rights as a participant in this study.
Potential for pain/discomfort	Not applicable.
Benefits to participants	Ensuring curricula is current, relevant and complete is an essential role of academic management and faculty of the Health Science programs. Students may be assured their program addresses the requisite learning outcomes to provide them with the relevant knowledge and competencies. Alumni, as new healthcare professionals, can provide valuable insight and may be instrumental in affecting improvements to their chosen profession and practice.
How will participants be recruited?	The Health Science division meet regularly and is comprised of all Health Science faculty and academic deans. An overview of the study and invitation to participate will be issued at this meeting. Follow-up conversations will take place by email and Zoom discussions. Students and alumni will receive an invitation to participate by email.
Exclusion/inclusion criteria	Alumni must be currently employed in the healthcare industry.
How will participants consent be taken?	Consent will be taken at the first focus group or interview.
How will confidentiality be	A summary of each focus group or interview will be

ensured?	provided to participants for their feedback. This practice will demonstrate to participants the confidential management of collected data.

Research Ethics Approval Committee for Health

Attach the following (where relevant):

1. Participant information sheet (Appendix C, E, G, I, K, M, O)
2. Consent Form (Appendix D, F, H, J, L, N, P)
3. Health history questionnaire
4. Poster/promotional material
5. Copy of questionnaire/ proposed data collection tool (questionnaire; interview schedule/ observation chart/ data record sheet/ participant record sheet) (Appendix Q, R, S)

Signed by: Principal Investigator or Student Supervisor

_________________________________ Date: ___________________

Signed by: Student or other researchers

_________________________________ Date: ___________________

Considered by REACH at meeting on:

____

Decision of REACH:

Action Required:

Section B: Application for Research Ethics Approval

Summary of Ethics Approval Process:

The purpose of this research is to determine stakeholder’s perceptions and knowledge of health informatics, specifically as it pertains to the development and integration of biomedical/health informatics curriculum. Stakeholders of health informatics education are those that are affected by it. This group has been identified as: health science faculty, students, academic management and alumni. All stakeholders have an affiliation with the Higher Colleges of Technology (HCT). Application for research ethics approval will be sought through the Research Ethics Review Board of HCT. This committee meets each month at which time the required documentation is reviewed. The researcher may be invited to attend a portion of the meeting if clarification is required.

Documentation required by the Research Ethics Review Board is the research proposal, a summary identifying potential participant groups, their roles and responsibilities. The Board will require evidence addressing confidentiality, anonymity and security of collected data. These elements are addressed in the research proposal, a summary of which will be included to highlight essential information.

To prepare for this process, the researcher arranged meetings with the chairman of the Ethics Review Board. Required documentation and essential elements for inclusion have been discussed. The Higher Colleges of Technology has no checklist of requirements to guide researchers in the ethics approval process and it was therefore difficult to be sure if all mandatory documentation had been collected for submission. To date, no problems have been encountered at the HCT level.

Securing ethics approval to approach alumni has required extra consideration by the HCT Ethics Review Board. Initially, it was not clear if ethical approval should be requested from their employer as well as HCT. However, the chairman of the Ethics Review Board has determined that as this group is being approached through their affiliation with HCT, consideration for ethics approval should come from this body. As a matter of professional courtesy, the researcher will discuss this with members of the Research Council of Health Authority of Abu Dhabi. Discussion and interview topic areas will be shared with the Council and evidence of their acceptance/approval will be requested.

Lessons Learned:

Through the process of completing the research proposal and dialogue with my supervisors, I have become more aware of details embedded in the ethics approval process. In particular, defining plans to minimize biases has introduced me to techniques not yet considered. Specifically, the practice of reflexivity was studied. Literature review suggested such practice also serves as an audit trail, providing an opportunity to convert my thoughts and assumptions into text, thereby facilitating further evaluation and action. Therefore, plans to routinely document in a journal following focus groups and interviews have been included in my research proposal. What appears to be a fairly simple task could produce much valued information and assistance in the research process. As I am a faculty member at HCT, it is essential that I declare this bias and maintain constant focus on the two roles I will be assuming. This reflective journal will facilitate such focus and as such is of critical importance.

A second outcome of this ethical approval process has been an increasing improvement in my ability to discuss and defend my research topic. As I meet with experts in the field of research to discuss ethical considerations I have had to answer numerous questions about my project: the purpose, the aim, the methodology, the design and more. Initially, this was done with some hesitation but as I am required to discuss and defend, I have gained confidence in the planned research and conversations reflect this. Also, areas requiring further attention have become apparent and the learning cycle continues.

Appendix M – Focus Group Guide

The following discussion areas will be addressed with each participant group. This topic guide will be developed into a schedule of open-ended questions to facilitate discussion.

Faculty
• Understanding of health informatics as it applies to specific health profession • Levels of experience with health informatics in practice • Levels of experience with health informatics in education • Perception of relevance of health informatics • Possible methods of integrating health informatics in program curriculum
Academic Management
• Understanding of health informatics as it applies to health science programs • Levels of experience with health informatics in practice • Levels of experience with health informatics in education • Perception of relevance of health informatics • Possible methods of integrating health informatics in program curriculum • Impact on health science program strategic and operational planning
Students
• Understanding of health informatics as it applies to specific health science program • Levels of experience with health informatics in practicums • Levels of experience with health informatics in academic setting • Perception of relevance of health informatics • Possible methods of integrating health informatics in program curriculum
Alumni
• Understanding of health informatics as it applies to specific health profession • Levels of experience with health informatics in practice • Levels of experience with health informatics in education • Perception of relevance of health informatics • Possible methods of integrating health informatics in program curriculum

Framing Questions for Discussion in Focus Group

- Each focus group will begin with an introduction and discussion of purpose.

- Discussions will be initiated with general questions about health informatics and their understanding of its application to their specific health profession.
- Specific questions will be introduced regarding informatics curriculum and their perspectives regarding the status of and need for this content within their program.
- My role will be to facilitate and not interject my thoughts or opinions with regards to health informatics.
- All discussions will be recorded and notes taken throughout the session.
- Each focus group should last approximately 45 minutes.
- Meeting rooms will be booked and refreshments provided at each focus group.

Sample Questions

Faculty	
Focus Group Guide	**Question(s)**
Understanding of health informatics as it applies to specific health profession	• How would you describe health informatics as it pertains to your health profession? • Can you tell me about various applications of health informatics in your specific field? • How would you describe the purpose of these health informatics applications?
Levels of experience with health informatics in practice	• Have you had any experience with health informatics either when you were a student, a health practitioner or as a faculty member? • How would you describe your level of expertise with health informatics applications?
Levels of experience with health informatics in education	• Can you tell me, as a health educator, how the theory and application of health informatics is addressed in your curriculum?
Perception of relevance of health informatics	• How would you describe the relevance of health informatics in your specific profession? • How would you describe the relevance of health informatics as a subject matter in your curriculum?
Possible methods of integrating health informatics in program curriculum	• Can you tell me how you include theory and practical application of health informatics in your curriculum? • How would describe students' learning and ability to apply this knowledge in practice?

	• Have you got any recommendations regarding possible methods of integrating health informatics into your program's curriculum? • How would you describe the collaboration with industry partners concerning experiential learning of health informatics?

Appendix N – Sample Focus Group Questions

<table>
<tr><th colspan="2">Focus Group – Sample Questions</th></tr>
<tr><th colspan="2">Introduction</th></tr>
<tr><td colspan="2">

Thank participants for attending
Briefly describe research project
Reinforce the fact their participation is voluntary and are free to leave at any time if they feel uncomfortable
All discussions will be confidential and anonymous
Inform participants the conversation will be recorded and transcribed
A summary of the discussion will be sent to all participants for their review and feedback
Any and all comments are welcomed and important; there are no wrong answers
Please respect everyone’s opportunity to speak
Ask participants if they have any concerns prior to focus group
Ask participants to sign the Consent form

</td></tr>
<tr><th colspan="2">Sample Questions</th></tr>
<tr><td colspan="2">Faculty</td></tr>
<tr><td>Focus Group Guide</td><td>Questions</td></tr>
<tr><td>Introductory Question</td><td>

Your group represents a variety of experts from clinical and allied health professions. Could each of you share a brief description of your background, both in healthcare and academia?
As colleagues, I was already aware of your profession, but now I feel I know you even

</td></tr>
</table>

	better…I look forward to a very engaging session with you today . . .
	• Could you share your thoughts on how the health industry has recently incorporated technology in your field specifically as it pertains to 'health information'?
	  ○ An example might be a new app or website may have been developed that you have used recently. Could you describe this and evaluate its effectiveness.
	  ○ For example, have you experienced any recent developments in the way health information is shared with:
	    ▪ Other health professionals (during clinical placement)?
	    ▪ Other health organisations?
	    ▪ Patients/families?

Understanding of health informatics as it applies to specific health profession	• How do you understand the term health informatics?
	  ○ What are your first impressions when you think of this term?
	  ○ Do you think it involves you in any way, either as faculty or health professional?
	    ▪ Is there any particular reason that you feel this way?
	• In your course preparations, for example, when searching the literature for course material, have you come upon any discussions of health informatics?
	  ○ Was this of any particular interest to you?
	  ○ Did you feel this was a topic that you and your students might find interesting/useful?
	  ○ Did you get a sense of how HI has evolved in your field recently?
	• Do you have any suggestions regarding how health informatics is / can be used in your specific field?
	  ○ Has this topic ever been included in your professional association's professional development/continuing education sessions?
	  ○ Has HI ever been an agenda item at your Industry Advisory Committee meetings here in the UAE?
	• What do you feel is the purpose of these health informatics applications?
	  ○ Is there any associated benefit of this HI application to your profession?
	  ○ What do you feel might be the cost of this HI application to your profession?

	• How / why do you think HI is useful in your field?
	  ○ Can you tell me more about this?
	  ○ We are all expatriates in this group; can you tell me how HI is being used in the healthcare industry your home country?
	• And, do you know if HI is being included in curriculum in your country's academic setting?

Levels of experience with health informatics in practice	• Can you tell me / us about any experience with health informatics either when you were a student, a health practitioner or as a faculty member?
	  ○ Can you tell us how confident and competent you felt when using these HI applications as in any of these roles?
	  ○ How well do you feel you have been trained to use HI?
	• How would you describe your level of expertise today with health informatics applications?
	  ○ Why would you describe it this way?
	  ○ Can you tell us what has contributed to this assessment of your expertise?

Levels of experience with health informatics in education	• How well / far do you think that the theory and practice of health informatics is addressed in your curriculum?
	  ○ Do you feel this level of tuition is appropriate for your students?
	  ○ Why do you feel this way? Please tell me more.
	• During your years as a student, was HI included in your curriculum?
	  ○ Do you think the concept/theory of HI was addressed at all and perhaps just not labeled as such?
	  ○ Can you give any examples of how HI was included in your curriculum?
	  ○ During your professional career (not your time in academia) has this ever posed a problem for you?
	    ▪ Could you describe this for us?
	    ▪ Was this a problem for you as a working healthcare professional?
	    ▪ How significant was this problem?
	    ▪ What would you suggested as a remedy?

	▪ Why would you suggest this?
Perception of relevance of health informatics *Possibly a duplicate question*	• How relevant do you feel that health informatics is to your specific profession? o Could you explain this a little more? o Could you give an example • If you were to reflect on the learning outcomes in your program, and in the courses you teach, has health informatics been included in any course material and/or discussions? o Do you feel this is appropriate for your students? o Do you feel your students are equipped with the relevant/appropriate graduate outcomes? o Have you had any feedback from industry regarding your graduates? ▪ Was their feedback related to HI in any way?
Possible methods of integrating health informatics in program curriculum	• Can you tell me how theory and practice of health informatics is included in your curriculum? o Have you had to provide this instruction and if so, how comfortable were you in discussing HI applications to your new healthcare professionals? • How would describe students' learning and ability to apply this knowledge in practice? o Were the students able to understand and apply this concept? o Could you describe any examples where students successfully applied HI concepts? o Could you describe any situations where students were not so successful in understanding and applying HI concepts in their respective fields? ▪ What do you think led to their specific level of successful application? ▪ Do you have any suggestions/recommendations for improvement? • Have you got any recommendations regarding possible methods of integrating health informatics into your program's curriculum? • To what extent is their collaboration with industry partners concerning experiential learning of health informatics? o Whose responsibility is it to provide training in HI applications, the academic setting or the

	professional setting?
	  ○ Could you elaborate on this for us please?
	  ○ How could this be done?
	  ○ What do you feel about collaboration between industry partners and academia?
	• Is there anything else that you think is important regarding HI in the curriculum?

Students	
Focus Group Guide	**Questions**
Introductory Question	• I know we have students from a variety of Health Science programs here today. Could each of you introduce yourself and tell us what program you are studying here at the college. • I know some of you as my students and I want to assure all of you, that your answers here today are confidential and will stay within this group. ○ You are not being assessed on this and please feel free to speak freely. • I will not discuss my findings with other student groups or with other faculty. • There are no right or wrong answers here and my primary goal is to gain an understanding of your perceptions of HI and if you feel it has any relevance to your chosen career.

Understanding of health informatics as it applies to specific health science program	• Let's start with that question… when you hear the term "health informatics" what do you think of?
	  ○ Have you ever heard this term before?
	  ○ Could you tell us where this term was first introduced to you, in the college or in the work placement setting?
	  ○ Is there any example or application of health informatics that comes to your mind?
	  ○ Would you mind sharing this with us?
	• Do you think HI is relevant or has any place in your career as a healthcare professional?
	  ○ Why do you feel this way?
	  ○ Could you explain this for the group?
	• Do you think you should be learning more about HI applications here, in your classes, or do you feel you are well prepared and ready to start your new career?

	○ Could you explain this assessment further?
Levels of experience with health informatics in practicums	• Can you tell me / us about any experience with health informatics during any of your practicums? ○ Can you tell us how confident and competent you felt when using these HI applications? ○ Could you describe how well your teachers prepared you to perform these tasks using HI? ○ Could you discuss if you were given enough instruction by your preceptor at the workplace to perform the required HI tasks? • How would you describe your level of expertise today with health informatics applications? ○ Why would you describe it this way? ○ Can you tell us what has contributed to this assessment of your expertise? • Do you have any recommendations for the faculty of your program regarding HI in curriculum? • Do you have any recommendations for the workplace preceptor regarding HI training?
Levels of experience with health informatics in academic setting	• How well / far do you think that the theory and practice of health informatics is addressed in your curriculum? ○ Do you feel this level of tuition is appropriate for you and prepares you for your profession? ○ Why do you feel this way? Please tell me more. • During your years as a student, to what level has HI been included in your curriculum? ○ Do you think the concept/theory of HI was addressed at all and perhaps just not labelled as such? ○ Can you give any examples of how HI was included in your curriculum? ○ During your practicums (experiential learning sessions) has this ever posed a problem for you? ▪ Could you describe this for us? ▪ How significant was this problem? ▪ What would you suggested as a remedy? ○ Why would you suggest this? ○ Who do you feel should be responsible for addressing your recommendation / suggestion?

Perception of relevance of health informatics	• How relevant do you feel that health informatics is to your specific profession?
	    ○ Could you explain this in a little more detail?
	    ○ Could you give an example?
	    ○ Do you feel this is appropriate for you and for your future career path?
	    ○ Do you feel you are equipped with the relevant/appropriate skills and knowledge regarding HI so that on graduation you could easily assume your role as a new healthcare professional?

Possible methods of integrating health informatics in program curriculum	• Can you tell me how the topic of health informatics is included in your curriculum?
	• Have you got any recommendations regarding possible methods of integrating health informatics into your program's curriculum?
	• When you go on work placement, have you been given any training in the use of their HI applications?
	    ○ Do you feel this was adequate?
	    ○ Were you well prepared to assume the tasks your workplace preceptor assigned to you (specifically as it relates to the use of HI)?
	    ○ Whose responsibility is it to providing training in HI applications, the college or the professional setting?
	    ○ Could you elaborate on this for us please?
	    ○ How could this be done?
	    ○ What do you feel about collaboration between industry partners and academia?
	        ▪ Could you provide any examples to help explain this collaboration?
	• Are there any other applications that you feel might be useful to you, either as a student or a new healthcare professional (or both)?
	    ○ Do you have any suggestions how this might be incorporated into your lessons here at the college?
	    ○ Is there any other venue where you might gain practical experience in the use of the HI application, other than the college or hospital?
	• What do you feel is the responsibility of the Ministry of Higher Education and the Ministry of Health

	in this regard? • Is there anything else that you think is important regarding HI in the curriculum?
Alumni	
Focus Group Guide	**Questions**
Introductory Question	• I know we have alumni from a variety of Health Science programs here today. Could each of you introduce yourself and tell us where you are working and in what capacity? • I know some of you were my students and I want to assure all of you, that your answers here today are confidential and will stay within this group. • There are no right or wrong answers here and my primary goal is to gain an understanding of your perceptions of HI and if you feel it has any relevance to your chosen career.
Understanding of health informatics as it applies to specific health profession	• When you hear the term "health informatics" what do you think of? ○ Have you ever heard this term before? ○ Could you tell us where this term was first introduced to you, in the college or in the work placement setting? ○ Is there any example or application of health informatics that comes to your mind? ○ Would you mind sharing this with us? • Could each of you tell us a little about your position and how long you have been working in this capacity? • Could you describe how health informatics is part of any of your daily or weekly routines? • Could you describe any potential plans to expand the application of health informatics in your department? • How would you describe your involvement in any of these planning sessions?
Levels of experience with health informatics in practice	• Could you explain how health informatics is used in your department… ○ What is your role and responsibility? ○ What are the roles and responsibilities of your colleagues?

<table>
<tr><td></td><td>What is the department’s role and responsibility?
Do you feel that you and your colleagues are competent in the use of these health informatics applications?</td></tr>
<tr><td>Levels of experience with health informatics in education</td><td>Reflecting on your years in college, how much time was spent on theory and application of health informatics?
Were you given the opportunity to apply your health informatics knowledge either at the college or in the professional setting?
How would you assess the education you received regarding health informatics at the college?
Did this adequately prepare you for your first position in the healthcare industry?
Were you required to take extra training in your new position before you were able to truly understand and be competent in using health informatics?
During your work placement sessions were you ever exposed to health informatics applications?
Could you provide more detail about this?
What was the level of support you received from the preceptor in the healthcare setting?
What recommendations would you make to the college about health informatics education?
What recommendations would you make to the healthcare setting about health informatics training?</td></tr>
<tr><td>Perception of relevance of health informatics</td><td>Considering the conversation today, as well as your experience in the healthcare environment, how would you assess the relevance of health informatics . . .
As it pertains to you in your professional position?
As it pertains to your organization?
As it pertains to your profession as a group?
Do you have any recommendations for any partner in education and/or delivery of healthcare regarding health informatics?
Do you have any recommendations for the health authorities and/or government regarding health informatics applications and staff preparedness?</td></tr>
</table>

Possible methods of integrating health informatics in program curriculum	• Do you feel there was enough health informatics instruction in your program at the college? • Do you feel the healthcare industry was supportive to you as a student and a new employee in the use of health informatics? Why? • Do you have any suggestions for the college or healthcare industry regarding the education and/or training of health informatics concepts and applications?
Academic Management	
Focus Group Guide	**Questions**

Introductory Question	• Your group represents a variety of experts from clinical and allied health professions. Could each of you share a brief description of your background, both in healthcare and academia?
	    ○ As colleagues, I was already aware of your profession, but now I feel I know you even better…I look forward to a very engaging session with you today . . .
	• Could you share your thoughts on how the health industry has recently incorporated technology in your field specifically as it pertains to 'health information'?
	    ○ An example might be a new app or website may have been developed that you have used recently. Could you describe this and evaluate its effectiveness.
	    ○ For example, have you experienced any recent developments in the way health information is shared with:
	        ▪ Other health professionals (during clinical placement)?
	        ▪ Other health organisations?
	        ▪ Patients/families?

Understanding of health informatics as it applies to health science programs	• What is your understanding of the term "health informatics"? • Which programs within our Health Science Division do you think require education and training in health informatics? • Can you give some examples of how this could be used by our students, faculty, and graduates?
Levels of experience with health informatics in practice	• During your career as a health professional, before joining academia, did you have any experience with health informatics applications?

	• Could you describe some examples of this and tell us how well prepared you felt to use these applications? • How would you assess the level of application of health informatics in your profession in today's healthcare environment?
Levels of experience with health informatics in education	• As an educator, have you included health informatics in any of your curriculum? • As a student, did you receive any instruction in the theory and application of health informatics? • Are there any recommendations that you would make as a result of this reflection on your time as a student and a faculty member?
Perception of relevance of health informatics	• What role do you feel health informatics plays in your professional field? • Can you identify what programs we offer that do not include health informatics in their curriculum? • Do you feel this is appropriate for that program and ultimately for the graduate of that program?
Possible methods of integrating health informatics in program curriculum	• Could you elaborate on any feedback you have received regarding support from industry partners in students' use of health informatics applications? • Could you describe any issues/problems that have occurred during work placement sessions in your programs? • What recommendations would you make for the college regarding health informatics? • What recommendations would you make the for healthcare industry partners regarding health informatics?
Impact on health science program strategic and operational planning	• To what extent do you feel the college provides adequate resources to student and faculty in the tuition of health informatics? • Could you give an example to support your opinion? • Are you aware of any future plans involving health informatics at the college level? • Could you describe this and explain how it might impact your faculty? • Are you aware of any future plans involving health informatics at the industry level? • Do you have any recommendations or suggestions regarding health informatics education and training in your program? At your campus?

Appendix O – Portion of Transcript of Academic Management Focus Group

Transcript: Academic Management Focus Group

- AM Participant 1
- AM Participant 2
- AM Participant 3
- AM Participant 4
- AM Participant 5
- AM Participant 6

Focus Group Guide	**Questions**
Pat	• What is your understanding of the term “health informatics”?
Participant 3	• Health informatics refers to any application of technology in healthcare. The primary example of HI is the enterprise health information system. This can connect all departments in the hospital so that all clinical and non-clinical health professionals can enter information about the patient and view comments and results that others have made about the same patient.
Participant 1	• To add to what ‘Participant 3’ has just said, and coming from an epidemiology background, I think ‘health informatics’ also encompasses care providers and governmental agencies outside the hospital or clinical setting. When I studied in the US I worked very closely with programs offered by the Centre for Disease Control. I have remained in contact with my colleagues at the CDC and to be honest, this is where I’ve heard the phrase ‘health informatics’ used. • The information in the electronic system can be collated to help trend and monitor disease incidence and prevalence at the local, regional and global level. • To me, health informatics is a large database of health data and will have multiple uses for all stakeholders of ‘health’

Participant 2	• I would agree with the definitions that 1 and 3 have offered. Health informatics is the use of technology in the healthcare environment. • When I think of the term ‘health informatics’ I think of the electronic health record first and foremost. I guess this is the first piece in the puzzle …. That forms the bigger picture regarding the use of technology in healthcare.
Participant 4	• Well, my background has nothing to do with the health field and I must admit that I am not very familiar with ‘health informatics’ and all that it encompasses. • However, just listening to my colleagues’ discussions and having an interest in all things of a technological nature, I would *guess* that health informatics is the use of technology (I got this by looking at “-matics”) to provide information or to inform the necessary people of health issues. • I realize that’s a very broad definition but from my analysis of the term, that’s the best I could come up with. • My research background has focused on the use of technology but in the academic setting…getting information to the various users and assessing their understanding of this information…
Participant 5	• My background is medical laboratory and health informatics, to me, is the use of technology to collect and store health information, in an electronic database, from all healthcare professionals who treat or provide care to the patient…and family too, I guess. • Specifically, for med lab health informatics is about lab tests that have been ordered and then subsequently the results • And, now that I think about it, the information system is also connected, here in the UAE anyway, to insurers and the Health Authority for a wide variety of reasons. • I think this all falls under the umbrella of health informatics too…connecting all users of health information using technology

Pat	• Which programs within our Health Science Division do you think require education and training in health informatics? • Can you give some examples of how this could be used by our students, faculty, and graduates?
Participant 1	• They all do!! Every graduate from all of our Health Science programs should have the knowledge and skills to use health informatics applications…however this may apply to their specific profession. • If, as you say, health informatics in its most basic form, is the health information system, then all graduates must be equipped with the competencies to enter, store, search, collate, track and trend health data. I can see all kinds of opportunities for the student as well as the graduate. • Examples for our students in health informatics…well, they must get some exposure to this during their clinical work placements and practicums. The nursing and med. Lab. students would benefit from entering patient clinical data and perhaps monitoring patient outcomes using this data. Health Management students would use the data for reimbursement, quality management, utilization management…those kinds of things. Paramedics would have the same sort of needs, I would think, as the nursing student… • Examples for staff are a little more difficult as we don't have access to a health information system at any of the colleges. We must look into this and explore the possibilities of training sessions for the faculty either at the hospital or maybe the vendor has training facilities. This is something we really must look into. • Once the student graduates, it's a little difficult for the college to get too involved in their continuing education or training. However, having said that, perhaps this needs to be explored as well. We could design professional development sessions for our graduates as well as other healthcare professionals…could even generate some revenue. We should involve our Continuing Ed. Department in this.
Participant 3	• I would agree with everything that '1' has said. Every healthcare professional is going to have some need to access the health information system. The most obvious programs that would need extensive training in

	informatics would be the Health Information Management and Healthcare Leadership programs. These are the professionals who are going to be entering, coding, monitoring the data as well as using the data for payment, budgeting, planning. I think these two programs have the greatest need with respect to Health informatics education and training. • As for examples, I think I've already covered the HIM and HCL students. But as '1' has said, the nursing, med. Lab., paramedic students definitely need to have some informatics included in their curriculum. Radiology students too…this is another profession that has technology at its very core. • And as '1' has mentioned, I would agree that the staff must get some exposure to health informatics, particularly as it relates to their profession. And, I think the best place for this would be in the hospital setting. All hospitals and clinics have an It Department and must have training facilities for their employees. Examples for faculty would then become how to enter the patient data…this is the entry level task that all will need, but of equal importance, they must be able to retrieve the data so informatics applications could integrate quite nicely with project management and research projects as well as data management classes. • Maybe we could get alumni to come to the college and offer sessions to the students and faculty… This would have to be at the hospital setting of course. And the idea of creating professional development programs, possibly with a graduate certificate is a definite possibility that we should be looking at. I think we should mention this at our next Industry Advisory Committee meeting and get something going.
Participant 2	• Of course, I agree with all that you both have discussed so far. But, it seems to me you're forgetting that we had an academic module of the 'X' system given to us 7 years ago! We had the very system that we're talking about here… given to us. It was worth a lot of money, and if I recall, only a couple of programs used the system as part of the curriculum. HIM and HCL used it here at our campus. But, Nursing, Med. Lab., Radiology, Pharmacy…none of these programs seemed interested in using it… Or, at least these programs never used it. I shouldn't really reflect on their 'interest', but as Associate Dean I can recall discussing this at divisional academic team meetings but could never seem to generate any interest. • We were able to monitor who used the system at each campus and records show it was only used by these two programs at this campus and no other.

	• I'm not sure why this was the case, other than of course the 'time' issue…that faculty didn't have the time to learn the system and in turn, did not or could not include it in their teaching
Participant 1	• I was not aware of this!!! Are you telling me that we had health information system software given to us and it was never used??!! How did this happen? Why was it never used? Was I here when this all took place? Why was I never informed?
Participant 2	• Well, as I say, this was given to us 7 years ago and we were given a 5-year license. Records indicate it was only used at this campus by those 2 programs.
Participant 1	• I was definitely here at that time. How did this happen? I wasn't informed of this at all…
Pat	• Perhaps we could arrange another session where this matter could be explored in more detail as I think, given its importance, it will require a fair amount of time and investigation.
Participant 1	• Yes, sorry, Pat…we got off track. You're right, good idea. '3', make sure to arrange a meeting with all of the academic management team. I need to understand the background here and how this could have ever happened. Is the vendor aware that this gift was so poorly utilized? We'll discuss this later.
Participant 4	• As Executive Dean of Teaching and Learning, I would definitely like to be involved in these meetings.

Appendix P – Sample of List of Words and Phrases

Phase 1: List of Words & Phrases

Faculty	Alumni	Student	Academic Management
80% classes (theory); 20%% projects in collect			
A cultural thing			
A department in the hospital is good at training			
A lot of theory			
A lot of theory			
Able to keep working when back at college – on HIS			
Able to show them			
Able to use system on work placement			
Able to work with system			
Academia			
Academic council might not approve of collaboration			
Academic health information systems			
Academic license			
Academic responsibility for college			
Academic team look at curriculum			
Academic version			
Acceptable standard			
Access patient data to do management			
Access to data to crate a report			
Access to health information system would be great – as student			
Accreditation			
Accreditation			
Accreditation – not going to measure up			
Accreditation bodies			
Actually helping			
Actually learning			
Add health informatics modules			
Adequate knowledge and skills			
Adequately prepared to use system			
Agenda			
All courses I teach			
All departments			
All graduates must be equipped with competencies			
All health science graduates need health informatics			
All health science students definitely need informatics included in curriculum			
All health science students require health informatics education			
All hospitals have training facilities			
All required to use it			
All staff know how to use new additions			
All time on lessons			

Allow information to be shared with physicians
Allowed to do basic functions on work placement
Allowed to use system
Allows information to be shared with other care providers
Allows information to be shared with patient and family
Allows monitoring patient outcomes
Allows monitoring staff proficiency
Alumni to offer training sessions to faculty
Alumni to offer training sessions to students
Application for ordering regular medications
Application in health information context
Application monitors blood sugar
Application of informatics
Applications
Applications
Applications
Applications besides electronic health record
Applications of health informatics
Apply knowledge
Appropriate education level regarding health informatics
Appropriateness of data
Are not given a chance to learn and train
Are we responsible for training
Ask at industry advisory committee
Assess programs
Assessing their understanding of this information
Assist physicians who do not know hot to use system
Assisting clinical staff with health information system
Assume industry knows our students' capabilities
Assume industry will allow students on system
At the core
Audit
Aware of patient demographic database
Basic procedures
Basic requirements
Basic things
Basic understanding of informatics
Basics important
Besides the electronic health record
Besides the health information systems
Best experience in private sector
Better environment
Better idea for college
Bring in all sorts of (content from) other classes
Budget
Budget to hospitals allowing training of health science students
Budgeting

Appendix Q – List of Words and Phrases – Academic Management

List of Words & Phrases – Academic Management

A cultural thing
Academic council might not approve of collaboration
Academic responsibility for college
Academic team look at curriculum
Acceptable standard
Accreditation – not going to measure up
Accreditation bodies
All graduates must be equipped with competencies
All health science graduates need health informatics
All health science students definitely need informatics included in curriculum
All health science students require health informatics education
All hospitals have training facilities
All required to use it
Allow information to be shared with physicians
Allows information to be shared with other care providers
Allows information to be shared with patient and family
Allows monitoring patient outcomes
Allows monitoring staff proficiency
Alumni to offer training sessions to faculty
Alumni to offer training sessions to students
Are we responsible for training?
Ask industry advisory committee
Assess programs
Assessing their understanding of this information
Assist physicians who do not know how to use system
Assume hospital staff know what to do with students
Assume industry knows our students' capabilities
Assume industry will allow students on system
Aware of patient demographic database only
Budgeting
Centre for disease control
Coding health information
Collaborative approach likely most feasible
Collaborative effort
Collage health data
Collate information
Collect responsible for providing theory
Collects test results
College does not have HIS system
Committed to providing complete education
Committed to providing current and relevant education
Complete the loop
Complying with diet
Complying with medication regimens

Confidentiality
Connected patient and caregiver using technology
Connected to health authority
Connected to insurers
Connecting all users of health information using technology
Connecting technology to system
Continuing education
Create a care circle
Creating professional development program
Credentialing processes
Crucial that students are given access to systems
Culture
Curriculum leader for nursing worked hard with hospitals
Data integrity
Database design
Decision making – clinical team
Decision making family
Decision making patient
Design professional development sessions for graduates
Design professional development sessions for healthcare professionals
Did not have enough time to learn
Did not have enough time to practice
Did not have health informatics class when teacher a student - exposed to IT
Discussions with academic council
Discussions with industry advisory committee
Do more in preparing for clinicals and practicums
Do not have access to HIS
Do not know how to access patient data
Do not know how to enter test results
Do not know what governments health informatics plans are
Do not understand why students did not pick up
Doctors educated both of us
Educate industry about student capabilities
Educators must assume some if not all responsibility for training
Electronic database
Electronic health record – example
Encompassed care providers
Encompasses governmental agencies
Enjoy exposure to another aspect of healthcare
Enough staff to train?
Enough staff to train?
Ensure healthcare industry is aware
Enterprise health information system – primary example
Entry level
Epidemiology practices
Every healthcare profession need access to HIS
Exciting developments
Existed in isolation

Explore possibility of training for faculty
Expose to more than their profession
Exposed to informatics early in career
Exposure during work placement
Extend practices
Focus on one particular type of information system
Follow nursing example
Forgetting we had access to HIS
Forgetting we had HIS given to college
Frustration
Future plans – virtual lab
Gained HIS knowledge as a teacher
Gap between curriculum, graduate competences and industry needs
Generate some revenue
Get direction from Academic Council
Get hospitals to do the training
Getting information to various users
Give examples
Give IT staff time to train students
Given 1 week of training of HIS
Given basic instructions in class
Goes far beyond that
Going to be a problem
Good to listen
Government has health informatics department
Government working on Smart health care system
Graduate certificate
Grateful for this meeting today
Great teaching tool
Had one health informatics class when teacher a student
Had to learn every module
Health informatics at core
Health informatics at core of profession (med lab)
Health informatics is a large database
Health informatics is at core of profession (HIM)
Health informatics play important role
Health informatics significant role in education
Health management students have greatest need for HIS training
Health management students have greatest need fro HIS education
Health management students would use the data
Healthcare facility hesitant to allow student to work with test system
Healthcare facility hesitant to allow students to work with system
Hospital assured students have good skills
Hospital best place for training
Hospital use same vendor
Hospitals assured students are not going to lose or harm data
Hospitals do have the system
How can academic team include health informatics

How did this happen
How did this happen
How to collect data
How to create a database
Human resource management
I remember not understanding
Impact compliance and influence healthcare funding
Impact every aspect of healthcare and management
Impacts all health science programs
Impacts compliance and influence utilization
Impacts patient compliance
Impacts patient education

Appendix R – Checklist – Perceptions of Health Informatics

Checklist
Data Analysis
Perceptions of Health Informatics

Sub-Theme	Academic Management	Alumni	Faculty	Students
Assumptions	X	X	X	X
Communication	X	X	X	X
Health Informatics	X	X	X	X
Purpose	X	X	X	X
Responsibility	X	X	X	X

Differences and Similarities Between and Amongst Focus Groups					
Differences amongst Groups	**Differences between Groups**	**Similarities amongst Groups**	**Similarities between Groups**	**Evidence of Sharing Insights and Innovation**	**Conclusion**
X	X	X	X	X	X

[Completed April 30, 2016]

Appendix S – Checklist – Preparedness for Health Informatics

Checklist
Data Analysis
Preparedness for Health Informatics

Sub-Theme	Academic Management	Alumni	Faculty	Students
Communication	X	X	X	X
Competency	X	X	X	X
Curriculum	X	X	X	X
Knowledge	X	X	X	X
Practicum	X	X	X	X
Resources	X	X	X	X
Training	X	X	X	X

Differences and Similarities Between and Amongst Focus Groups					
Differences amongst Groups	**Differences between Groups**	**Similarities amongst Groups**	**Similarities between Groups**	**Evidence of Sharing Insights and Innovation**	**Conclusion**
X	X	X		X	X

[Completed June 13, 2016]

Appendix T – Checklist – Future Plans Relating to Health Informatics

Checklist
Data Analysis
Future Plans Relating to Health Informatics

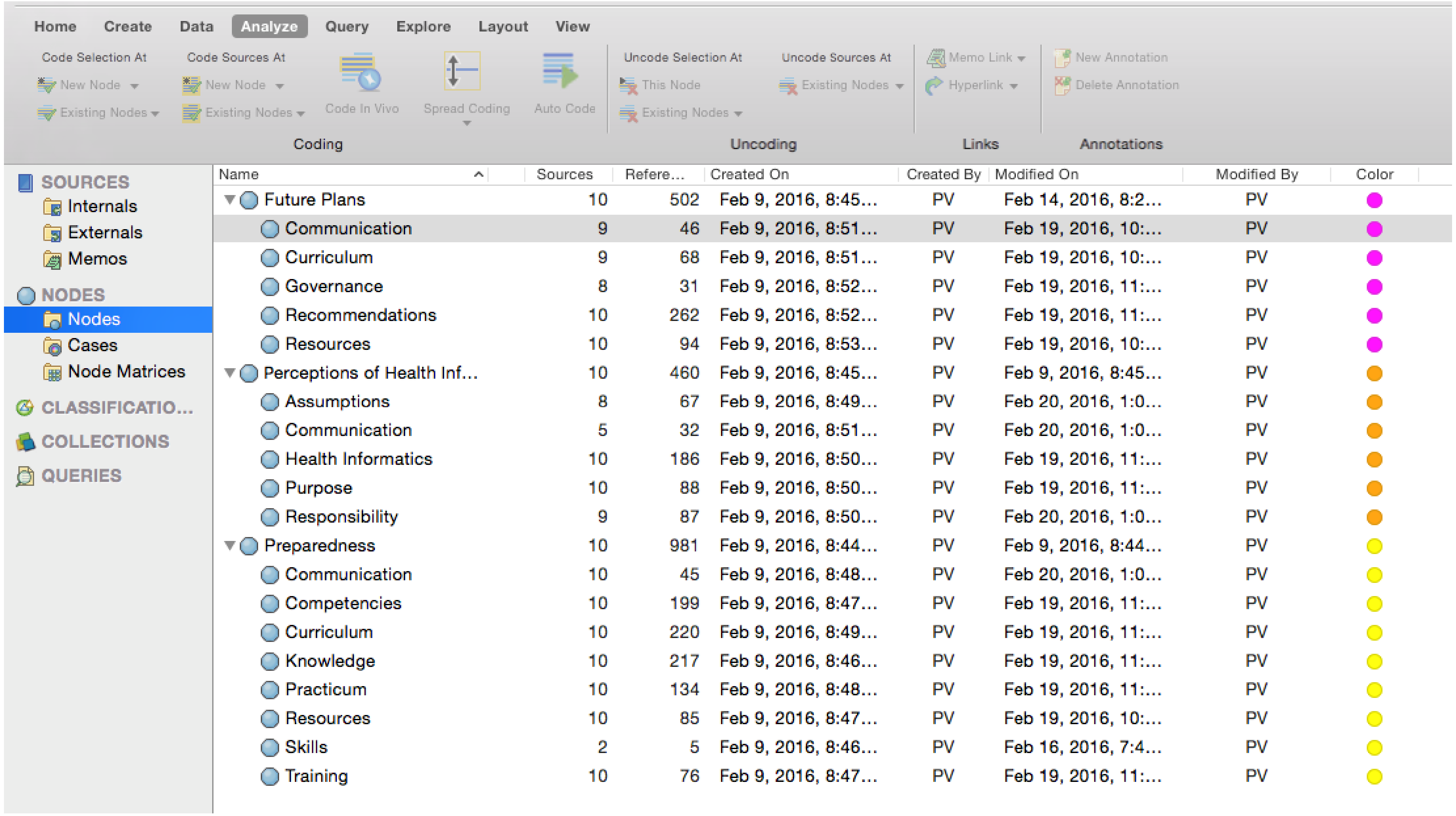
Sub-Theme	Academic Management	Alumni	Faculty	Students
Communication	X	X	X	X
Curriculum	X	X	X	X
Governance	X	X	X	X
Recommendations	X	X	X	X
Resources	X	X	X	X

Differences and Similarities Between and Amongst Focus Groups					
Differences amongst Groups	**Differences between Groups**	**Similarities amongst Groups**	**Similarities between Groups**	**Evidence of Sharing Insights and Innovation**	**Conclusion**
X	X	X		X	X

[Completed December 14, 2016]

Appendix U – NVivo Coding Framework

NVivo Coding Framework



Name	Sources	Refere...	Created On	Created By	Modified On	Modified By	Color
Future Plans	10	502	Feb 9, 2016, 8:45...	PV	Feb 14, 2016, 8:2...	PV	
Communication	9	46	Feb 9, 2016, 8:51...	PV	Feb 19, 2016, 10:...	PV	
Curriculum	9	68	Feb 9, 2016, 8:51...	PV	Feb 19, 2016, 10:...	PV	
Governance	8	31	Feb 9, 2016, 8:52...	PV	Feb 19, 2016, 11:...	PV	
Recommendations	10	262	Feb 9, 2016, 8:52...	PV	Feb 19, 2016, 11:...	PV	
Resources	10	94	Feb 9, 2016, 8:53...	PV	Feb 19, 2016, 10:...	PV	
Perceptions of Health Inf...	10	460	Feb 9, 2016, 8:45...	PV	Feb 9, 2016, 8:45...	PV	
Assumptions	8	67	Feb 9, 2016, 8:49...	PV	Feb 20, 2016, 1:0...	PV	
Communication	5	32	Feb 9, 2016, 8:51...	PV	Feb 20, 2016, 1:0...	PV	
Health Informatics	10	186	Feb 9, 2016, 8:50...	PV	Feb 19, 2016, 11:...	PV	
Purpose	10	88	Feb 9, 2016, 8:50...	PV	Feb 19, 2016, 11:...	PV	
Responsibility	9	87	Feb 9, 2016, 8:50...	PV	Feb 20, 2016, 1:0...	PV	
Preparedness	10	981	Feb 9, 2016, 8:44...	PV	Feb 9, 2016, 8:44...	PV	
Communication	10	45	Feb 9, 2016, 8:48...	PV	Feb 20, 2016, 1:0...	PV	
Competencies	10	199	Feb 9, 2016, 8:47...	PV	Feb 19, 2016, 11:...	PV	
Curriculum	10	220	Feb 9, 2016, 8:49...	PV	Feb 19, 2016, 11:...	PV	
Knowledge	10	217	Feb 9, 2016, 8:46...	PV	Feb 19, 2016, 11:...	PV	
Practicum	10	134	Feb 9, 2016, 8:48...	PV	Feb 19, 2016, 11:...	PV	
Resources	10	85	Feb 9, 2016, 8:47...	PV	Feb 19, 2016, 10:...	PV	
Skills	2	5	Feb 9, 2016, 8:46...	PV	Feb 16, 2016, 7:4...	PV	
Training	10	76	Feb 9, 2016, 8:47...	PV	Feb 19, 2016, 11:...	PV	

Appendix V – Sample of Summary Preparedness Relating to Health Informatics per Participant Group

Summary –Preparedness Relating to Health Informatics per Participant Group

Communication
Academic Management
Fact: • Members of senor academic management not aware of gifted academic HI software to all HS programs within college network • Have met with healthcare partners to discuss practicum and reinforce students' knowledge of security and confidentiality • Academic management not aware of HI curriculum in HS programs (what programs do/do not have HI curriculum and to what level) • Evidence of lack of communication between faculty and academic management regarding curriculum, matrix, graduate competencies • Lack of detailed, relevant discussions at Divisional Academic Team meetings re: HI curriculum
Analysis: • Lack of communication between and amongst academia at all levels • Not aware of significance of HI in HS professions until FG discussions • FG revealed/suggested significant gap between curriculum and graduate competencies and industry need **Findings As a result of Focus Group** • Not aware of significance of HI in HS professions until FG discussions • FG revealed/suggested significant gap between curriculum and graduate competencies and industry need **Theme:** • Communication problems between and amongst academia at all levels • Communication problems between academia and industry partners **What does this tell me about 'Communication' relating to health informatics?** • Communication acknowledged to be of key importance and yet little evidence the simple task of communication has been taking place between all stakeholders (internal and external, key and otherwise) • FG discussions informed all of the dire status of communication and plans made to address this

Quotes:

- Of course, I agree with all that you both have discussed so far. But, it seems to me you're forgetting that we had an academic module of the *Health Information System* given to us 7 years ago! We had the very system that we're talking about here… given to us. It was worth a lot of money, and if I recall, only a couple of programs used the system as part of the curriculum. HIM and HCL used it here at our campus.
- I shouldn't really reflect on their 'interest', but as Associate Dean I can recall discussing this at divisional academic team meetings but could never seem to generate any interest.
- I was not aware of this!!! Are you telling me that we had health information system software given to us and it was never used??!! How did this happen? Why was it never used? Was I here when this all took place? Why was I never informed?
- As a student we were required to retrieve, collate and monitor health data from the database and were given the most basic instructions on how to do this in class! I can remember not understanding, not knowing how to get started
- My main responsibility and main area of training focused solely on the equipment I used to perform the tests. So, as far as that is concerned, I was well prepared…but that's where it ended.
- As my wife is a cancer survivor, I can certainly attest to the importance of sharing information quickly…sharing lab results and pathology results as quickly as possible. Even when the news was not good, we were grateful, as it allowed us to make plans.
- Health informatics can play a role in not only decision making by the clinical team, but by the patient and their family
- I'm afraid to think! Can you program chairs inform me, please?!
- And, I'll be looking into this 'gift' we were given and did not use. I need to understand why this was so poorly utilized and why all program chairs didn't take the initiative to incorporate this in their program matrix and curriculum.
- I think we need to include this in our next agenda of the Industry Advisory Committee meeting, a more immediate need is to ensure the healthcare industry is aware of how important it is for the students to have access to their systems. They need to be assured that our students have good, basic skills and that they're' not going to lose data or harm data or go home and chat about what they've seen.
- We need to educate industry about our students' capabilities
- Listening to this, I can see there are some traditions and beliefs that are still held very close. I mean, it seems that the students are so liberal and like any other student from the West, but then you hear this and it's a reminder that in many ways, they haven't changed too much at all. And why would they? I think this is so interesting! I didn't realize that's how they viewed health issues

Communication
Alumni
Analysis: • Few faculty ever discussed HI – never used the term • HI projects helped to prepare for professional duties after graduation • Not aware HS students are coming to departments for practicum • Poor communication on college's part – not informing industry of practicum needs, roles, responsibilities • Poor communication on industry's part – information staying in 'training department' and not reaching area receiving students for practicum • Hospitals have experts and systems but students still not allowed access; there is no planning done • No communication takes place between all stakeholders to prepare for practicum or discuss industry and academia need • College, industry and government share blame for lack of preparedness and communication re: HS practicums and need for HI training
Findings As a result of Focus Group • Become team member of Project addressing design of global health informatics curriculum (one participant on project team and after FG discussions, other participants eager to join • Alumni eager to work together to improve curriculum, practicums and access to HI software for current and future HS students in their salient programs **Theme:** • Alumni gained greatest proportion of knowledge regarding HI after graduation, when they joined the workforce • Alumni experienced lack of communication from their teachers (Hi discussed in varying degrees if at all) • Alumni all noted they were expected on hire to know HI systems and noted this is a significant gap in curriculum as had neither required level of knowledge nor skill • Academia not communicating with industry partners regarding what programs to offer to meet industry need • Academia not communicating with industry partners regarding what curriculum to include in programs (teaching 'unnecessary stuff') • Enhanced awareness of industry's perception of graduates has inspired alumni to work together to change this perception noting this can only be done by equipping students with relevant, requisite knowledge and competencies. • Unsatisfactory communication in healthcare environment regarding HI profession – no one knows responsibility, roles, purpose…. **What does this tell me about 'Communication' relating to health informatics?** • Academia does not communicate well within, between programs regarding HI, HI curriculum, HI needs during practicum

• Academia and industry do not communicate well regarding requisite graduate knowledge and competencies • Academia and industry do not communicate well regarding requisite student knowledge and competencies (for practicums) • Faculty demonstrate varying degrees of HI competency, knowledge • Projects significantly helped student to apply HI knowledge; recommend more projects with academia and industry
Quotes: • The market is full of them. • Ask the question • As I say it was more with IT rather than healthcare. And that's probably why a lot of healthcare professionals don't study or know about health informatics or electronic systems related to health care until they join the workforce that does have such a system • We are a little bit sensitive about the word 'health informatics' because people keep confusing 'us' with 'them'. • What happened is we used to have the same system but each facility had a firewall and you could only see patients within your facility. What we did was broke the glass basically. Now physicians can not only see patient information from different facilities, they can go to the other facility, treat the patient there **without having to do any extra step like creating credentials** for them there • Because lots of hospitals within SEHA, government hospitals, see sponsored patients like police cases, prisoners and then when they are discharged from our hospital they go back to the prison clinics under the Abu Dhabi Police Health Care System. So what they are still in discussion of is that Abu Dhabi Police Health Care System would buy Cerner as well and they would join us on the same database. So that even prisoners care would be simultaneous. When they are discharged and go back to their healthcare system – all their information and all their data is there and they just continue on with their treatment • We had no idea what health informatics was! • When I came back to study the Bachelors degree in 2013…ten years later…I think I came back with more information about health informatics from my place at work than what was available at HCT or in my education. This is because I was in the workforce; because I was in the market and getting real time information while I think the **educational institutions, not just HCT, but probably all education institutions that provide health education even nursing schools, pharmacy schools, medical schools…they did not catch up with the speed of using technology in the work place as fast as they should have** • So people who were graduating even from medical school, medical students…they would come to be interns or residents at hospitals; they had no idea what electronic systems were. And you cannot blame them because the university still does not having any related to that yet • They would **try to introduce as much as they can to their education to make sure that the students are prepared for the work place but unless they are in touch with the work place they would not know what they need to teach them**. • Sometimes we teach students stuff that it not applicable and sometimes we are not teaching them stuff that is already in place. • The problem is that when you get a person who is highly competent in stuff that totally does not relate to your field – they are not competent

- I mean, what we really wish would happen is that someone would come and see what we need or someone would give us a place where we could put our suggestions of what we need in their graduates; And, what kind of graduates we do need.
- It is important for people in those fields to understand the differences and commonalities in those fields
- I think the Minister of Education and the Minister of Health need to talk to each other. Because only if they talk and they set up a two-way communication between the two ministries or departments then people at lower levels of management can start to talk
- The difficulty comes with the fields that are new or emerging, that people, for example if we talk about a health informatics, HIM, clinical administration and so on, people still don't see the importance the way we do see it
- They have to understand the complete picture

Communication
Faculty
Analysis: • Faculty preparedness occurred during conference • Faculty met with hospital to discuss student need but still not given access to HI • There is a lot of information going around re: HI but whether the student understands it is questionable • Faculty took initiative to meet with hospital staff to develop training program • HI appears in salient literature but faculty does not include as not area of expertise • Have included HI in curriculum "without really planning to or thinking about it" (discussions of impact of technology on medical mistakes) • Used iPads and apps for community health programs – very successful (but didn't refer to it as HI) • Many literature resources re: HI which is then included in teaching even though not on matrix • Need access to HI • Not aware had academic HI software • Suggested using apps such as Zoom to communicate with students on practicum as has recording capabilities • Excellent support from industry partners • No communication and/or support from industry partners • Met with industry partners to discuss student need with good / bad outcome

• Poor communication results in ineffective practicum experience • Faculty aware of importance/significance of HI as prevalent in literature in curriculum even though not on matrix include in curriculum as teach to matrix • No time to investigate HI and its applications to specific program – teach to matrix only • Accreditation requirement
Findings As a result of Focus Group • Shared insights – fostered enthusiasm to improve/change situation • Initially stated as HI not their area of expertise was not their responsibility to include in curriculum; as a result of FG discussions became aware of areas where HI could be included in curriculum and project design to facilitate complete student learning • Awareness that profession and academia were 'ignoring' or 'dismissing' HI as of questionable significance; as result of FG discussions Faculty had greater understanding of specific applications of HI in their relevant professions. • Discussed the possibility of using technology more effectively to communicate with students during practicums, such as Zoom virtual meetings **Theme:** • HI theory and application had not been included or 'communicated' to faculty during their education; learned of HI recently at conferences and in literature • Unaware that college had gifted academic HI software – little to no communication regarding this vital resource • Levels of communication directly proportionate to success of practicum and students' ability to access required HI software in hospital setting • Awareness that to date had ignored HI but this was a professional and academic disservice which must be changed • Awareness that HI curriculum an accreditation requirement **What does this tell me about 'Communication' relating to health informatics?** • HI was communicated to faculty, both as a student and as a faculty member, in varying degrees which resulted in their assigning varying degrees of importance to it • Communication relating to HI in academia is unsatisfactory • Communication relating to HI between academia and industry is unsatisfactory • FG raised awareness of need to improve communication amongst and between HS programs and all stakeholders
Quotes: • I have read about 'health informatics' as it pertains to med. Lab. And, there have been some papers presented at conferences that I've attended where health informatics was the focus. Actually, the students who attended the conference with me, were quite interested in some of the applications that

were presented at one conference… It used the iPad so of course, any such technology was of interest to these students!

- We have had problems with this, but basically, we use an awful lot of communication technology
- How do they communicate with the patient? The potential is there to improve…definitely
- I would say there is a big lack from our students' point of view in really understanding the PACS and the RIS and HIS when they are in the hospital There is a lot of information going around but whether they understand it coherently or not, I'm not sure We try to show them this at the college but we don't have a big film library and we don't have two machines that we can send information to and fro
- We have met on several occasions, during our own time, as that's the only way to get things done, and have designed a program for the nursing students.
  - I have held meetings, I have discussed the students' abilities, the courses they take, their knowledge of confidentiality and data security…all of this, and yet they are very hesitant, and even resistant, to allowing the students access. This is the case for the majority of my students.
  - To be honest, I haven't given it much thought as to how it applies to biology, anatomy and physiology curriculum but I am aware that there are many applications of technology in the healthcare setting …but how they apply to my curriculum…I just haven't given it too much thought.
  - we were struggling to understand and use it to its full potential.
  - Each area within the lab works as if in isolation. We get the request for the test, we perform the test, and we enter the results. But this system and informatics is much more than this, I think. We could use it for monitoring the patient, educating the patient…really tailoring the care to the patient's needs
  - . I try to include many references to health informatics (or health information systems) in all of the courses I teach. I believe that technology, again, THIS, is at the core of our profession and so the students need to start learning about this as soon as possible.
  - But, in my teaching I must admit that I don't use the specific term 'health informatics' even though, now that I'm thinking about it…it is actually health informatics! The lab results are collected, collated and tracked; then, this information is made available to physicians, patients and other members of the healthcare team…I just hadn't thought of it in those terms!
  - I haven't ever discussed 'health informatics' in my classes, but again, in the life sciences I didn't think there was much of an impact or use for it. But, that was according to my understanding of it! I'm learning a lot just listening to you ladies and I'm starting to think how it could be used in my classes.
  - It is interconnected with all that we do…this is why I try to make sure I refer to it in all my courses that I teach (but after today, I'm going to start calling it 'health informatics' and not just the 'health information system'…because of course, it does so much more than just collect health information.
  - I can't really think of any suggestions of how health informatics could be used in life sciences. There are a lot of apps available that I use to teach anatomy, for example, so I'm not sure if this is considered 'informatics' or not?
  - As far as having any skills or understanding of an electronic information system, or 'health informatics' if that's what it's called, I don't think we're

preparing them well at all, if I were to be very honest.

- Our health informatics curriculum is more IT-focused than informatics focused and isn't really useful or interesting for the students.
- I think we have to be careful as the fundamental…the basics that each of us studied and now teach to our students, are also very important.
- So, to answer your question, I don't think the college is preparing the students well at all for their future role in healthcare. Its something we have to address in more detail and not just leave it at 'well, we're doing 'informatics' but we're just not calling it that'…not good enough!!
- I don't think this has happened here just yet…I don't think 'industry' knows quite what to do with our graduates…I think our graduates are a little more advanced than some healthcare facilities. Or, at least this is my impression when I visit students on work placement.
- In fact, in our Industry Advisory Committee meetings here in*City, they (industry) say it isn't their responsibility…that the student should know how to maneuver through Cerner, for example, before they leave the college!
- We need a system, an academic HIS, where the students can learn and play and not worry, in the beginning, about compromising a hospital's health information system!
- Well, I first want to say that I feel our HIM students are given more than adequate theory and application opportunity to make sure they are very familiar with the health care system. When I visit them on work placement, as we've discussed earlier, they are very comfortable within the first few days and are able to navigate the system quite well.
- I've seen this, too, where doctors and nurses do not seem to be comfortable at all with the HIS and much prefer the paper chart. I would have to assume this is because they either haven't had enough training as a student or as a professional, or both. And, usually we at the college say that the students are so comfortable with technology because they've grown up with it, but in my experience, age has not seemed to be a factor. I have seen both young and not so young clinicians have difficulty with *Health Information System.
- I would just like to add that while I'm listening to you, I can see that health informatics studies can no longer be denied to all health science students. I think we need to start in first year and carry on through to the last semester, no matter what program is.
- I will be quite interested to read the results of your research as I think this is a fairly significant problem, especially when we start to look at the other professions other than HIM
- Unless a clinical student has a real love for technology, they're going to slip through the four years, memorizing definitions and theories but won't know how to make it work…to know the full potential of the information that is right there for them.
- I think there are many pieces to this that need to be looked at, both in the academic setting and in the healthcare facility

Appendix W – Sample of Data Analysis – Final Summary

Data Analysis – Final Summary
Preparedness for Health Informatics

Communication:
Analysis:
Academic Management

- Lack of communication between and amongst academia at all levels
- Not aware of significance of HI in HS professions until FG discussions
- FG revealed/suggested significant gap between curriculum and graduate competencies and industry need

Alumni

- Few faculty ever discussed HI – never used the term (majority of Alumni said this)
- HI projects helped to prepare for professional duties after graduation
- Poor communication on college's part – not informing industry of practicum needs, roles, responsibilities, competencies, knowledge level
- Poor communication on industry's part – information staying in 'training department' and not reaching area receiving students for practicum
- Hospitals have experts and systems but students still not allowed access; there is no planning done
- No communication takes place between all stakeholders to prepare for practicum or to discuss industry and academia needs
- ***College, industry and government share blame for lack of preparedness and communication re: HS practicums and need for HI training***
- ***Academia providing programs and producing graduates that industry does not need; no apparent communication between partners (and yet Alumni aware of IAC as are members of committee…???)***

Faculty

- Poor communication results in ineffective practicum experience
- Faculty aware of importance/significance of HI as prevalent in literature
    - Include in curriculum even though not on matrix
    - Do not include in curriculum as teach to matrix
- No time to investigate HI and its applications to specific program – teach to matrix only
- Accreditation requirement

Student

- Use communication tools in projects with patients focusing on support/education (Comm. Health)
- Industry voiced displeasure that college did not provide student with HI education and training
- ***Little communication on what happens between college and industry partners***
- ~~Hospital and college need to discuss a plan for student re: practicum before students' arrival~~
- Weekly meetings facilitated understanding of HI competencies and needs during practicum
- Weekly meetings during practicum made student feel part of team
- Healthcare industry not aware of programs at college
- Needs to be closer communication between teacher and preceptor
- ***Teachers do not use term 'health informatics' but students aware the discussion is of HI (more familiar than teacher with concept)***
- First learned of HI at conference, not college
- No classes dealing with HI; not prepared for applications in healthcare setting

Findings As a result of Focus Group

Academic Management

- Not aware of significance of HI in HS professions until FG discussions
- FG revealed/suggested significant gap between curriculum and graduate competencies and industry need
- Not aware of accreditation requirements regarding HI curriculum in HS programs – plans to investigate and share feedback international accreditation team regarding HI

Alumni

- Become team member of Project addressing design of global health informatics curriculum (one participant on project team and after FG discussions, other participants eager to join)
- Alumni eager to work together to improve curriculum, practicums and access to HI software for current and future HS students in their salient programs

Faculty

- Shared insights – fostered enthusiasm to improve/change situation
- Initially stated as HI not their area of expertise was not their responsibility to include in curriculum; as a result of FG discussions became aware of areas where HI could be included in curriculum and project design to facilitate complete student learning
    - Suggests poor communication between and amongst faculty teaching within and across HS programs
- Awareness that as both a professional and academic they were 'ignoring' or 'dismissing' HI as of questionable significance; as result of FG discussions Faculty had greater understanding of specific applications of HI in their relevant professions.
- Discussed the possibility of using technology more effectively to communicate with students during practicums, such as Zoom virtual meetings
- Discussed use of inexpensive / free HI applications in projects; enhance learning and generate enthusiasm and interest for both faculty and student (curriculum described as all theory and boring to both partners in academia)

Student

- Students feel a responsibility to inform academic management regarding their concerns with practicums, industry & faculty support, and lack of appropriate and relevant HI content in their curriculum
- Students plan to work together to create proposal for presentation first to HS Chair and then to Academic Council, MOH and MOE
    - Plan to involve all HS students in needs analysis re: HI (first informing them then assessing them) and preparing report for presentation to above noted key stakeholders
- Students feel a responsibility to share concern; if they don't tell then they are also to blame for situation
- Weekly meetings with preceptors worked well and this will be communicated to faculty
- Students expressed keen interest in communication component of HI – wanting to help fellow students, family, community
- Projects involving communication component of HI generated keen interest; however, cultural implications/concerns admitted and discussed
- Equity of HI applications in community discussed and concerns voiced; plans to do a project involving health information kiosks in labour camps

Theme:

Academic Management

- Communication problems exist between and amongst academia at all levels
- Communication problems exist between academia and industry partners
- Communication problems have resulted in significant gaps in programs offered; in curriculum offered; in graduate knowledge and competencies provided
- HS curriculum and matrices outdated, incomplete and require major review and revision
- Academic Management is not aware of accreditation requirements for HS programs [causes concern for level / quality / effectiveness / efficiency of

academic management team…or at least of their communication and listening skills]
- Unaware that college had gifted academic HI software – little to no communication regarding this vital, expensive resource

Alumni
- Alumni gained greatest portion of knowledge regarding HI after graduation, when they joined the workforce
- Alumni experienced lack of communication from their teachers (HI discussed in varying degrees if at all)
- Alumni all noted they were expected on hire to know HI systems and noted this is a significant gap in curriculum as had neither required level of knowledge nor skill
- Academia not communicating with industry partners regarding what programs to offer to meet industry need
- Academia not communicating with industry partners regarding what curriculum to include in programs (teaching 'unnecessary stuff')
- Enhanced awareness of industry's perception of graduates has inspired alumni to work together to change this perception noting this can only be done by equipping students with relevant, requisite knowledge and competencies.
- Unsatisfactory communication in healthcare environment regarding HI profession – no one knows responsibility, roles, and purpose….
- Described HI as a new concept in healthcare and that the healthcare industry does not know what to do with it…where to place it in the organizational chart etc.

Faculty
- HI theory and application had not been included or 'communicated' to faculty during their education; learned of HI recently at conferences and in literature when preparing for classes
- Unaware that college had gifted academic HI software – little to no communication regarding this vital resource
- Levels of communication directly proportionate to success of practicum and students' ability to access required HI software in hospital setting
- Awareness that to date the participant had ignored HI but this was a professional and academic disservice which must be changed
- Awareness that HI curriculum an accreditation requirement

Student
- Students share common concerns regarding lack of communication from faculty regarding: HI, practicum expectations, ability to access HI applications
- Students share common concerns regarding lack of communication from Academic Management regarding: HI, practicum expectations
- Students share common concerns regarding lack of communication from preceptor regarding HI, practicum expectations
- Expressed keen interest in communication component of HI
- Experienced benefits of good communication practices during practicum: confident in responsibilities, expectations and place as member of the team (going to recommend this model to faculty and HS supervisor)

What does this tell me about 'Communication' relating to health informatics?
Academic Management
- Academia does not communicate well within, between programs regarding HI, HI curriculum, HI needs during practicum
- Communication acknowledged to be of key importance and yet little evidence the simple task of communication has been taking place between all stakeholders (internal and external, key and otherwise)
- FG discussions informed all of the dire status of communication and plans made to address this specifically regarding:
    - Free academic HI software
    - Accreditation requirements / reports
    - Curriculum review / matrix review

Alumni

- Academia does not communicate well within, between programs regarding HI, HI curriculum, HI needs during practicum
- Academia and industry do not communicate well regarding requisite graduate knowledge and competencies
- Academia and industry do not communicate well regarding requisite student knowledge and competencies (for practicums)
- Faculty demonstrate varying degrees of HI competency, knowledge
- Projects significantly helped student to apply HI knowledge; recommend more projects with academia and industry

Faculty

- HI was communicated to faculty, both as a student and as a faculty member, in varying degrees which resulted in their assigning varying degrees of importance to HI
- Communication relating to HI in academia is unsatisfactory
- Communication relating to HI between academia and industry is unsatisfactory
- FG raised awareness of need to improve communication amongst and between HS programs and all stakeholders
- FG raised awareness of need to gain HI knowledge and competency and include in curriculum (including theory and experiential learning)

Student

- Some Students are experiencing positive outcome as a result of effective communication from faculty and industry partners
- More often, however, students are experiencing negative outcomes as a result of ineffective communication from faculty and industry partners
- Plans made to improve communication amongst students and between programs regarding HI and to inform faculty and academic management

Conclusion - Communication:

Consensus that communication is ineffective and must improve between all internal and external stakeholders

Unaware of current status of HS curriculum and matrices at academic management and faculty level [FG informed Academic Management and Faculty of need for HI curriculum]

Unaware of accreditation requirements re: HI [programs had recently been accredited but standards, findings and recommendations not shared with other HS Faculty in other programs – poor communication]

Alumni and Students noted varying degrees of knowledge / competency / confidence regarding HI amongst HS Faculty

Varying degrees of Faculty knowledge / confidence / experiences regarding HI could have possibly transferred to Students (complacency, laxity regarding HI applications and their responsibility relating to HI in profession)

However, Students and Alumni both express interest in HI and an understanding of the potential for HI to improve health outcomes indicating that complacency in Faculty has indeed not transferred to Student and Alumni group [also FG created interest in HI within the Faculty groups)

Possibly, the keen interest and understanding demonstrated by Student group has transferred backwards or up to the Faculty [*the child shall teach the man*]

Student and Alumni participants voiced a greater understanding of HI and the need to know how to use this in their chosen profession

Alumni discussed impact of poor communication:

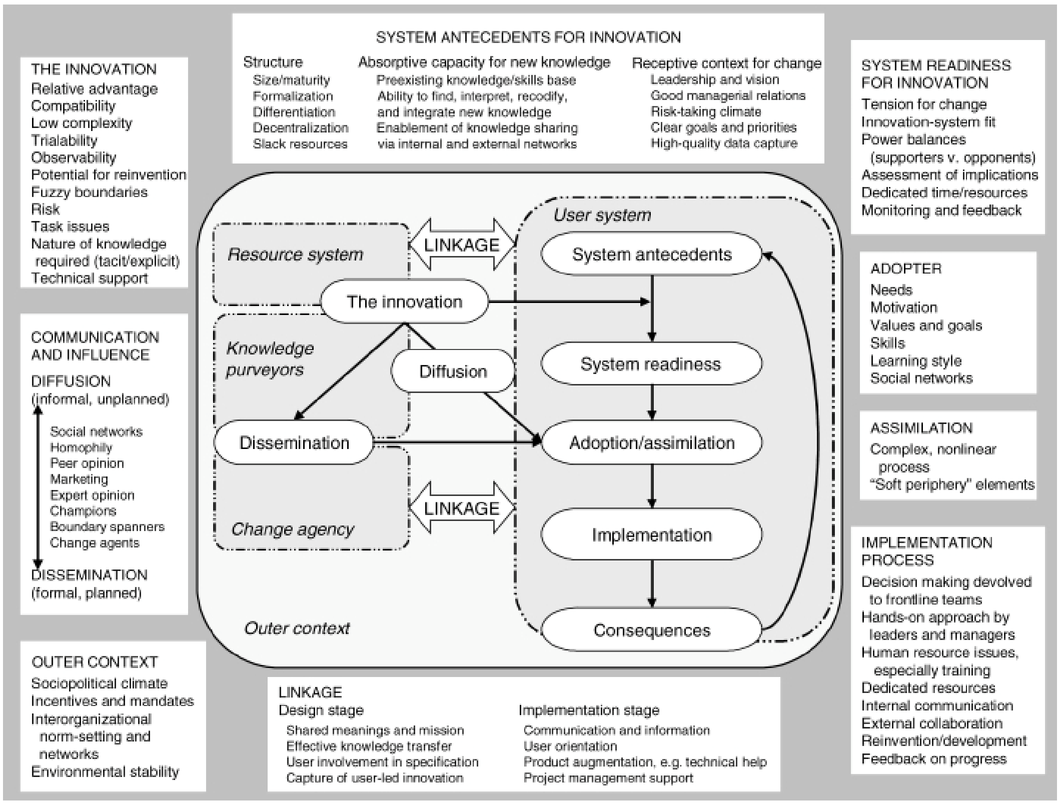
Graduates equipped with unnecessary HI skills

Graduates not equipped with any HI skills

FG initiated a desire to improve communications at all levels

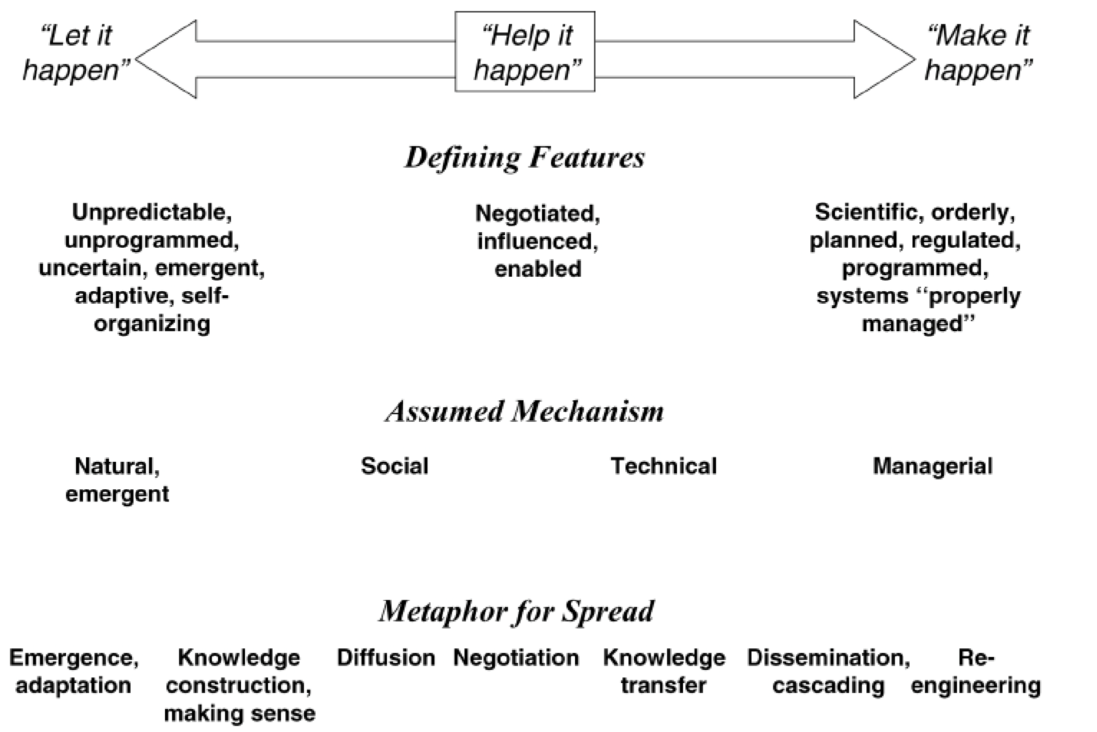
Suggested meetings, poster presentations, needs analysis, Virtual meetings and classes

Appendix X – Conceptual Model for Considering the Determinants of Diffusion, Dissemination, and Implementation of Innovations in Health Service Delivery and Organization, Based on a Systematic Review of Empirical Research Studies



Source: Greenhalgh, T., Robert, G., Macfarlane, F., Bate, P., Kyriakidou, O. (2004) Diffusion of Innovations in Service Organizations: Systematic Review and Recommendations. *The Milbank Quarterly*, *82*(4), 581–629. http://doi.org/10.1111/j.0887-378X.2004.00325.x

Appendix Y – Different Conceptual and Theoretical Bases for the Spread of Innovation in Service Organizations



Different Conceptual and Theoretical Bases for the Spread of Innovation in Service Organizations

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